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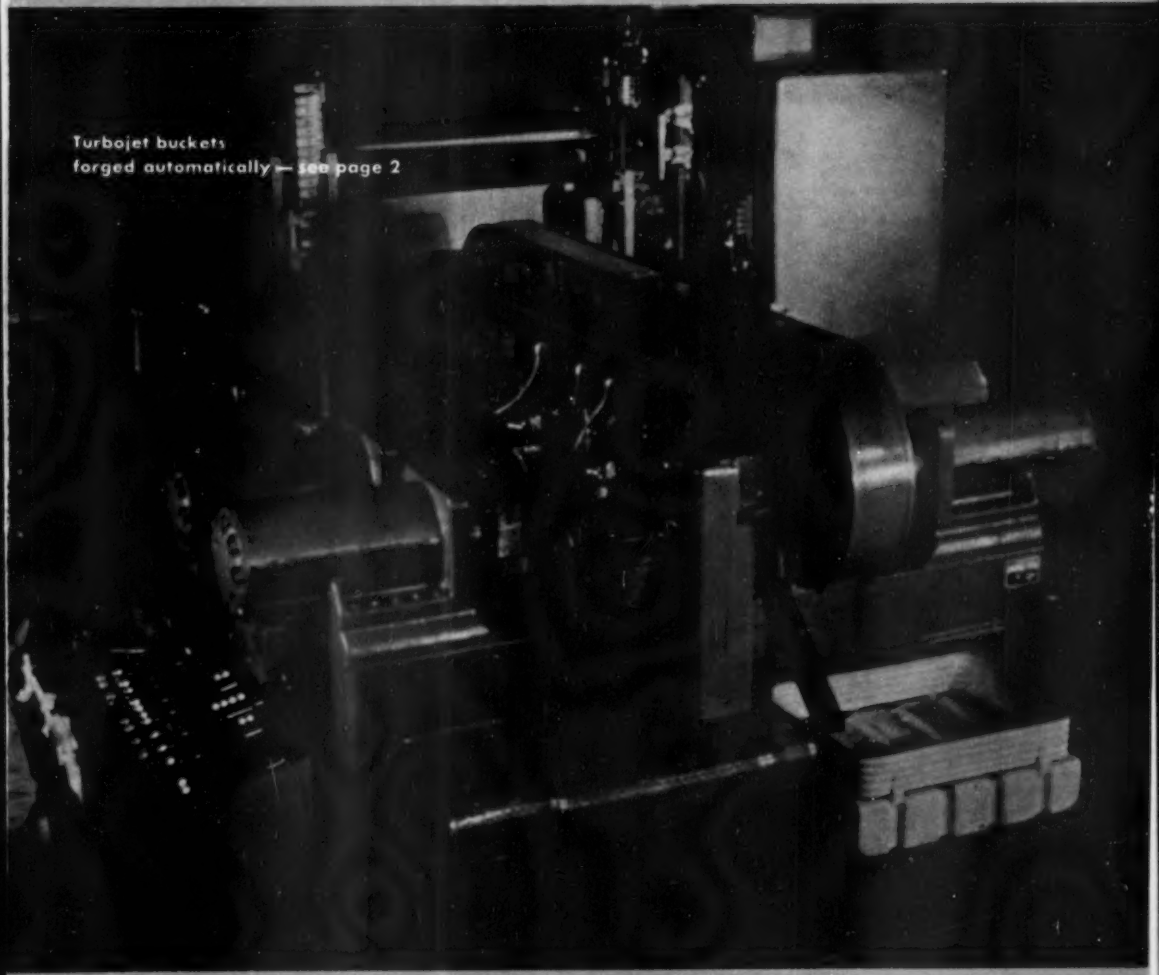
American Machinist

NOVEMBER 24, 1952

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

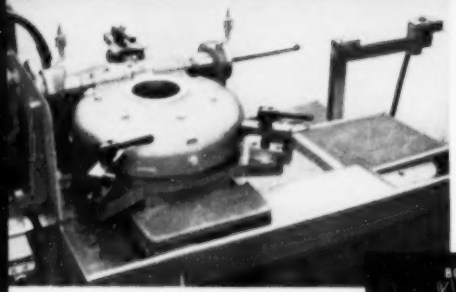


Turbojet buckets forged automatically — see page 2

Curtiss-Wright Cuts Machining Costs A Third With Machinability Data

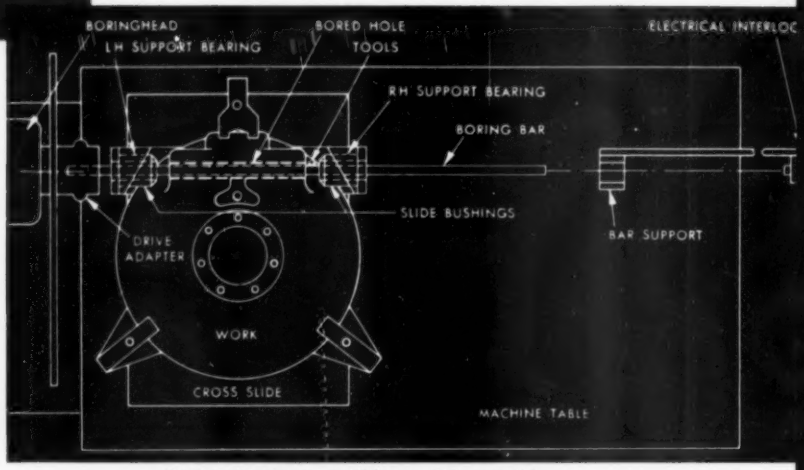
New Machining Setups for Packard Diesels

Special Welders Assemble Thin-Wall Stainless Tanks for Guided Missiles

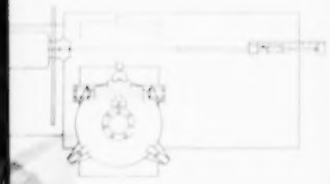


SEPARATE SUPPORT

solves long-bore problem

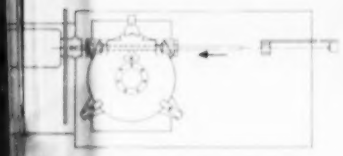


Plan view of tooling set-up utilizing separately supported boring bar for precision borizing of long, small-diameter holes.



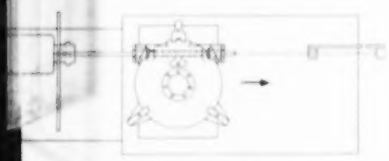
1. PART LOADED

With boring bar retracted to right, and cross slide in forward position, part is loaded and held in platen type hand strap clamping fixture.



2. BORING BAR INSERTED

With cross slide indexed to boring position, boring bar is inserted through support bearings and hole in work, and locked in place by drive adapter on boringhead. Only one set of tools is used so tools are not fed through work prior to boring.



3. BORING STROKE

As table is traversed to right, boring bar tools are, in effect, "pulled" through the bore. Table then out-bores left to eliminate drag line.

Heald Model 224 Bore-Matic with separate boring bar arrangement gives chatter-free finish to long, small-diameter holes

• Where the length to diameter ratio of a bored hole exceeds the limitations of a damped quill, a separate boring bar arrangement may provide an effective solution to the problem. The above set-up of a Heald Model 224 Bore-Matic for borizing large magnesium cases is a typical example.

The boring bar, while in operation, is supported in double outboard slide bearings, one on each side of the work. This provides ample rigidity for smooth, chatter-free borizing throughout the length of the bore. The boring bar cradle at the right of the table includes an electrical interlock switch so arranged that the bar must be completely retracted from the work before the cross slide can be indexed to the loading and unloading position.

Remember — when it comes to precision finishing, it pays to come to Heald.

HEALD

Heald precision speeds the nation's production

INTERNAL AND ROTARY SURFACE GRINDING MACHINES AND BORE-MATICS

THE HEALD MACHINE COMPANY

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American Machinist

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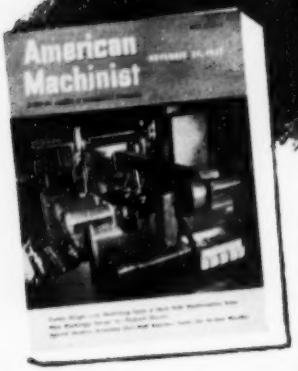


Clips & Quips

1 Turbojet Blade = 2 Impacts . . . Our cover shows, in color, a new way of making jet-turbine buckets. The second Impacter built by Chambersburg (Pa.) Engineering, it will go to Packard, although it is currently producing stainless-steel buckets at the Chambersburg plant. Ultimate equipment will include two Tocco induction heaters, feeding heated blanks alternately to the conveyor over the twin (one blocking, one finishing) Impacters. A description of the principle appeared in *AM* for Nov 10, as well as the story of the first unit, at International Silver. This machine, a radically new principle in forging, is the outgrowth of an idea of Eugene Clarke, Sr, before World War II, but which lay dormant until time for development was available. It is particularly intriguing in that it requires mechanization—no hand can place work with sufficient accuracy.

The Kodachrome was taken by Eugene Clarke, Jr, and proved superior to professional shots taken at the time.

Machinability Applied . . . Curtiss-Wright has proved of material assistance to the cause of optimum machining rates in publishing two Air Force reports on machining. Both have appeared first in *American Machinist*. Now C-W takes another step worth watching by applying the correct tool material (HSS, hard alloy, or carbide) to machining operations, based on available speeds and feeds. Selections were made on the basis of microstructure of the piece, allowable metal-removal rate, and nature of the cut (plunge or generating). Setups, mostly on turret lathes and Bullards, have cut machining costs a third. The detailed story makes up our Special Report.

Tooling . . . In addition to our Special Report and the Navy diesel story, we have three other important tooling articles in this issue. First, there's B Jahn Mfg Co, Hartford, which made a progressive die for 30-cal machine-gun clips. Numerous forming stations for radii were gotten into exact registration with a grinding templet laid out in relationship to one center and set up on the grinder so all form blocks could be ground successively . . . Second, E J LaBroad, chief tool engineer of Associated Tool Engineers, Inc, Boston, provides a guide for diamond-pin locaters.

Sub-zero Brittleness . . . Sam Tour has recently studied what heat-treatments make tools suitable for use under arctic conditions—a job for the Quartermaster General. Some tools, perfectly usable in the States, are far too brittle under sub-zero conditions. Here are answers.

Navy Diesels . . . Ben Brosheer, our Chicago associate editor, has selected from Packard's new Navy-diesel line the setups that are unusual and broadly applicable. We bring them to you in five pages of excellent pictures.

Management Matters . . . Two articles in this issue, both short, provide food for management thought . . . First is details of an elaborate, and almost human, mechanical hand. General Mills designed and built it . . . W W McCall covers a kind of fire insurance you may not have—the kind that protects you in case your equipment or men start a fire that burns your landlord's building.

Thin-wall Welding . . . Special machines for overlapping spot welds, and special fixtures for gas-shielded arc welding, solved the problems of Bell Aircraft in welding the stainless-steel fuel tanks for jet aircraft. R L Brown tells, in our lead article, how Bell engineers worked out the job.

Coming . . . *AM* for Dec 8 will include a further report on Ford automation, data on Solar Aircraft welding methods, other articles on cutting elliptical holes, on high-frequency brazing, on flame-fluxing, on tooling for tough steel, on estimating needed floor space, and on several other subjects that will interest you. Our cover shows a big miller at Cooper-Bessemer.

EXPERIMENTER . . . Robert L Brown, assistant foreman, Experimental Department, has been with Bell Aircraft Corporation, Buffalo, NY, since 1940. He began as a bench hand and later was a spot welder. Mr. Brown has worked on such aircraft as the P-39 *Airacobra*, P-63 *Kingcobra*, P-59 *Airacomet* (first US jet), the rocket-powered X-1 series (world's first supersonic plane), the X-5 (first plane capable of varying the degree of wing sweepback in flight) and the X-2 (not yet released). He is presently assigned to Bell's guided-missile work. Mr. Brown is a graduate of Buffalo State Teachers College and holds a BS degree in Industrial Arts. He is the author of our current article on welding stainless tanks.

GLEASON

PROUDLY ANNOUNCES

The No. 140 Rolling Quench Machine

The No. 140 Rolling Quench Machine is an entirely new machine designed for holding and quenching heated shafted parts with a minimum of distortion. Handles shafts up to 40" long and 4" diameter. Ideal for job lots or high production.

GLEASON

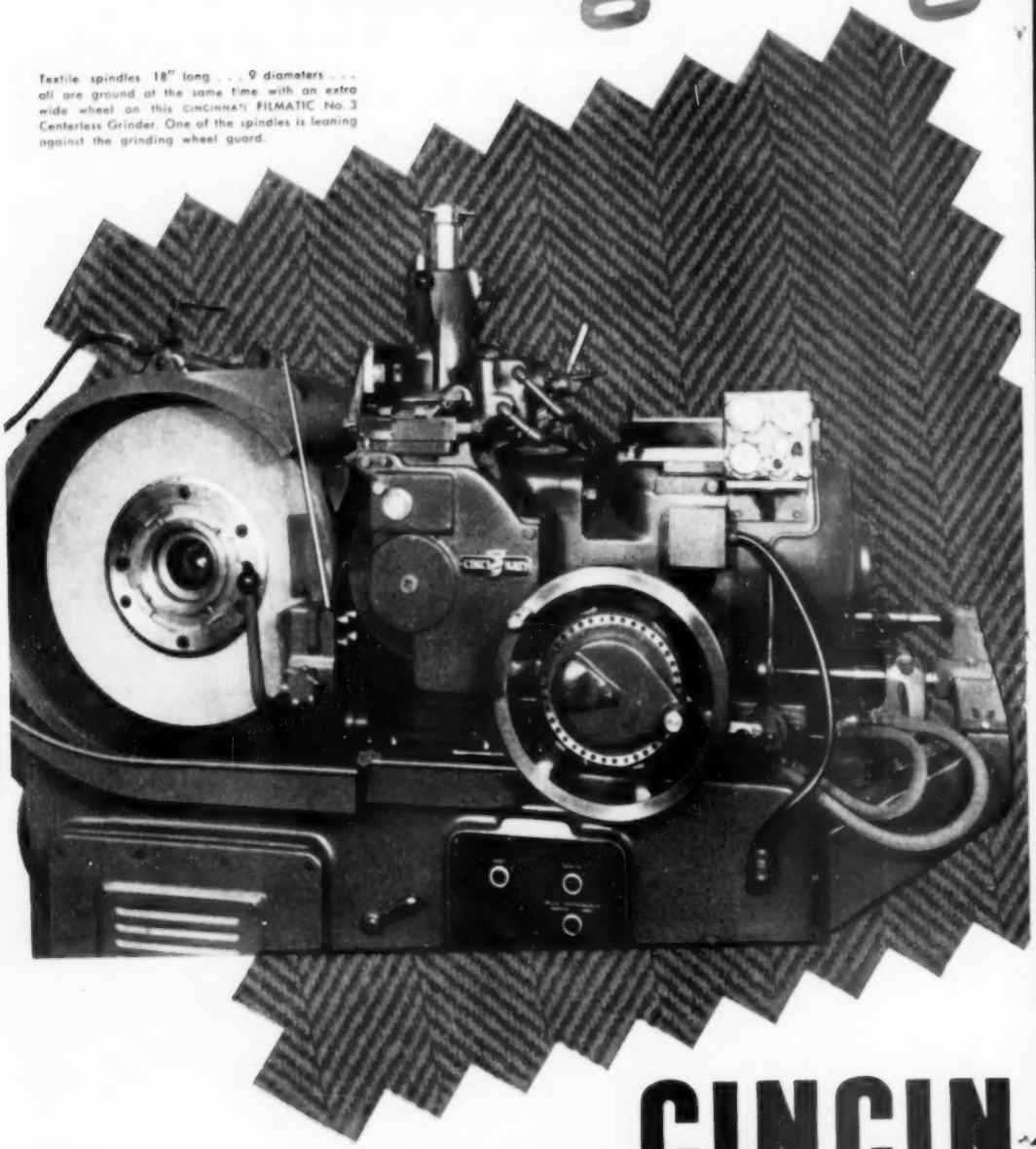
GLEASON WORKS

BUILDERS OF BEVEL GEAR MACHINERY FOR OVER 85 YEARS

1000 UNIVERSITY AVE. - ROCHESTER 3, NEW YORK

infeed grinding

Textile spindles 18" long . . . 9 diameters . . . all are ground at the same time with an extra wide wheel on this CINCINNATI FILMATIC No. 3 Centerless Grinder. One of the spindles is leaning against the grinding wheel guard.



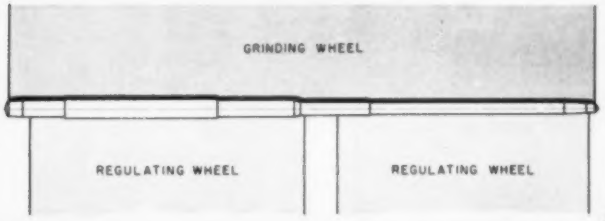
CINCIN

18" length

OF TEXTILE SPINDLES

It's usually a discouraging job to precision grind long, slender parts by conventional methods requiring backrests. Such parts are springy and tend to induce chatter; they're difficult to size; several setups and handlings may be required. You can change all this by grinding such parts on CINCINNATI FILMATIC Centerless Grinders. The equipment illustrated here shows how it can be done in only two operations. ¶ Cincinnati Application Engineers tooled up a CINCINNATI FILMATIC No. 3 Centerless Grinder with special wheelheads for 20" wide wheels, extra range hydraulic profile wheel truing units, and an air retraction unit for the regulating wheel slides to provide additional clearance for loading and unloading. ¶ The entire length indicated in the drawing is rough ground and then finish ground. Only two operations complete the job of grinding 9 diameters to accurate tolerances. ¶ Advantages of the No. 3 Centerless for work of this type include FILMATIC grinding wheel spindle bearings . . . they eliminate spindle flutter (source of chatter) and without adjustment, they withstand any load imposed upon them. The regulating wheel spindle has an outboard anti-friction support. A 25 hp motor drives the grinding wheel spindle. Additional data in catalog No. G-570-2. Of course these machines are in short supply at this time, but you should consider their possibilities now for future production.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO



Drawing of part ground on the CINCINNATI FILMATIC No. 3 Centerless Grinder illustrated here.

Part Name	textile spindle
Material	steel
Operation	grind entire length in two infeed operations
Stock Removal	.012" first operation; .003" finish operation
Production (estimated)	30 per hour first operation, 35 per hour finish operation

CINCI NATI

CINCINNATI FILMATIC No. 3 Centerless Grinding Machine. Complete information may be obtained by writing for catalog No. G-570-2. Brief data in Sweet's Catalog File for Mechanical Industries.

FILMATIC

NATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
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How SNOW-NABSTEDT

The 6.48" junion being cut on Fellows "36" at Snow-Nabstedt Corporation.

GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES

uses 2 Fellows "36's"

to cut herringbone reduction gears

The left hand helix of 24.48" mate to pinion being rough- and finish-cut on second Fellows "36."

The Snow-Nabstedt Gear Corporation of Hamden, Conn., for years a leader in the manufacture of marine reverse and reduction gears, is now applying its know-how to the manufacture of standardized Reduction Gears for use in industrial, construction, and agricultural equipment.

To achieve top production, Snow-Nabstedt uses two Fellows 36-Type Gear Shapers simultaneously for cutting the 24.48" bull gear of the 3.9 to 1 reduction unit. The right hand helix of the herringbone is cut on the first machine. Then the gear blank is transferred to the second "36", 'flopped over', and the left hand helix cut. When a production run of mating pinions is put through, the same procedure and the same cutters are used. Production times are tabulated below.

For precision cutting of coarse pitch, broad face gears, the 36-Type Gear Shaper is in a class by itself. 'Beefed-Up' to take heavy cuts, it has the rigidity to hold fine finish as well. For good gears at low cost, investigate the Fellows 36-Type!

PRODUCTION DATA

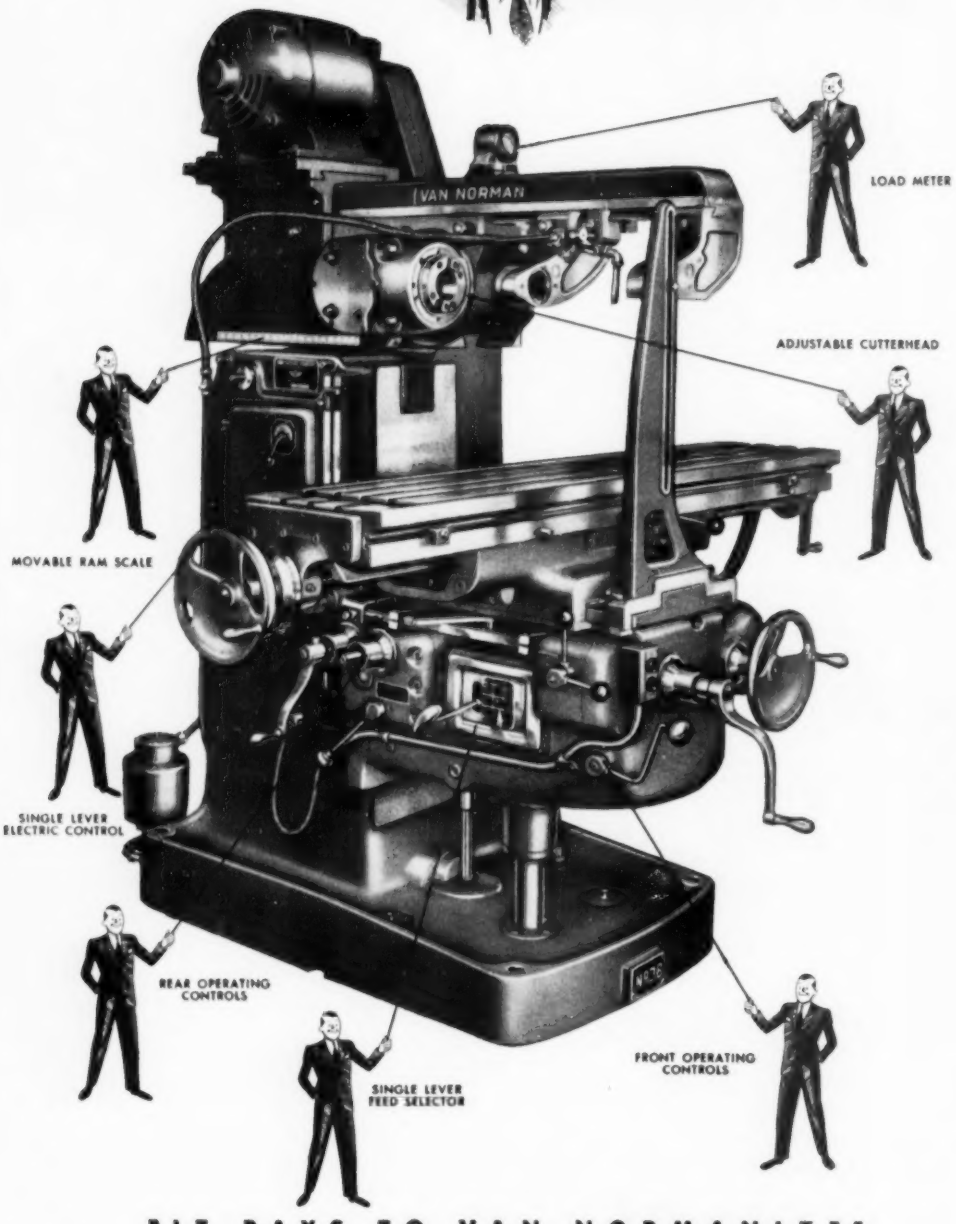
	Gear	Pinion
Outside Diam.	24.486 in.	6.486 in.
Pitch	5/7	5/7
No. of Teeth	121	31
Pressure Angle	20°	20°
Helix Angle	23°	23°
No. of Cuts	2	2
Limits (Mic. over balls)	±.002	±.002
Time—Roughing*	118 min.	23 min.
—Finish Cuts*	109 min.	34 min.

*For each hand of helix

Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department • 78 River Street, Springfield, Vermont
Branch Offices: 323 Fisher Bldg., Detroit 2 • 5835 West North Avenue, Chicago 39 • 2206 Empire State Bldg., New York 1

Look at the



"IT PAYS TO VAN NORMANIZE"

Production Advantages of the

VAN NORMAN

RAM TYPE MILLER

Regardless of the type of plant or the type of work, Van Norman Ram Type Millers can cut your milling costs and speed vital production. These versatile millers reduce idle machine time by as much as 50% because they enable the operator to perform conventional horizontal, vertical and angular milling on *one* machine. Look at what Van Norman Ram Type Millers can do for you —

Adjustable Cutterhead

By merely positioning the cutter head, the operator can perform horizontal, vertical or angular milling . . . the work of three single-purpose machines.

Increased Work Range

Movable ram plus the saddle crossfeed increase the work range and capacity of the miller . . . enable you to handle larger work pieces with ease.

Front and Rear Controls

Operating controls are located at front and rear for ease of operation. They eliminate back and forth operator motion . . . reduce operator fatigue.

Simplified Electric Control

Built-in electric controls simplify operation. Single lever selector controls spindle, feed, and coolant. Push button, on front of knee, starts and stops motors as pre-selected.

Load Meter

Built-in load meter indicates percent of load at which the cutter is operating. It enables the operator to operate miller at maximum efficiency . . . helps to prevent overloading of the miller motor.

Any way you look at it, the Van Norman No. 38 Ram Type Miller is your best buy for cutting costs, increasing production and accuracy.

Van Norman Ram Type Millers are available from 37" to 64" table lengths.

Write for complete information, today.

VAN NORMAN COMPANY

Springfield 7, Massachusetts

5 THREADING
by LANDIS

LANDIS *Machine* COMPANY

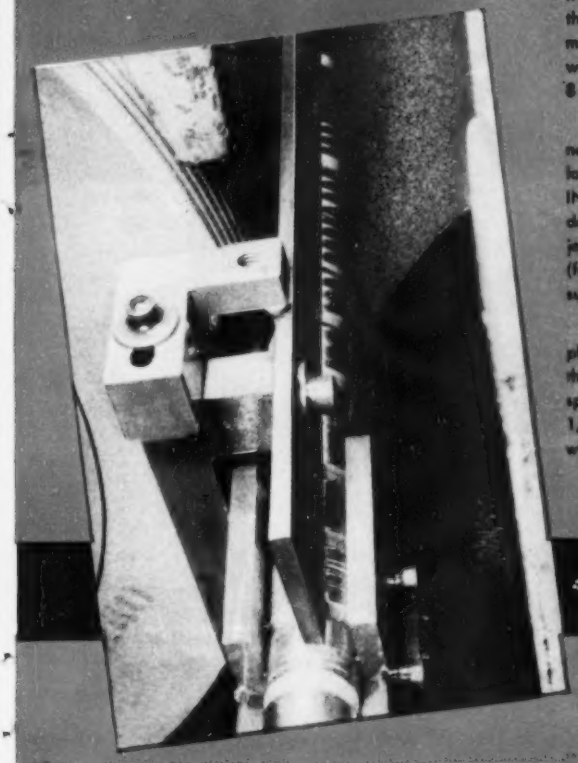
THE WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF THREAD

PASSES ELIMINATED

Centerless Thread Grinders

BENDIX-WESTINGHOUSE in Elyria, Ohio, recently installed two *LANDIS* #1 Centerless Thread Grinders for threading slack adjuster gear worms used in automotive air brakes. This new threading method resulted immediately in fewer threading operations, fewer rejects, savings in critical materials, and longer product life.

Gear worm blanks are made of alloy steel, heat-treated to a 285-311 Brinell hardness. Former methods had required 7 separate passes to complete the threads. Threads were rough-cut before heat-treating in one pass, then finish-ground in six passes after heat-treating.



Using the *LANDIS* Centerless Thread Grinders, threads are now completed after heat-treating in two operations. Both machines are arranged for "upgrinding", a method developed by *LANDIS*, which allows up to 30% greater work surface speeds while maintaining concentricity and finish. Upgrinding allows deeper cuts, and threads are finished in two passes. For example, on the machine producing 3½ pitch threads on 1¼" gear worms, roughing takes a .106" cut, finishing .089", with 8 pounds of metal removed every hour.

Other important advantages have resulted from the new process. By grinding threads after heat-treating, locked-in stresses are eliminated, and BENDIX-WESTINGHOUSE reports show that product life has been doubled. In addition, a reduction in the number of rejects and the elimination of a nubbing on the workpiece (formerly required to facilitate threading) has effected substantial savings of critical materials.

This successful production story can be retold in your plant. Centerless Thread Grinders, built exclusively in the United States by *LANDIS*, are designed for high-speed mass production of screw threads ranging from 1/16" to 4½" in diameter. Please send specifications when writing for additional information.

LANDIS TOOLS — REG. U.S. PAT. OFF.

WAYNESBORO PENNSYLVANIA

GENERATING EQUIPMENT

6 Cost Cutting Ideas with Modern Landis Plain Grinders

Landis tooling combines grinding operations . . . cuts cost per finished piece

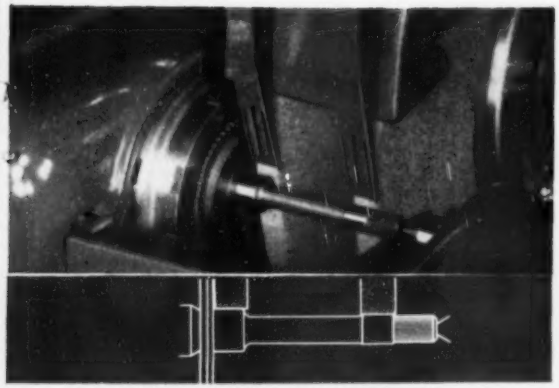
155

10" x 18" Landis Type CH Plain Hydraulic Grinder

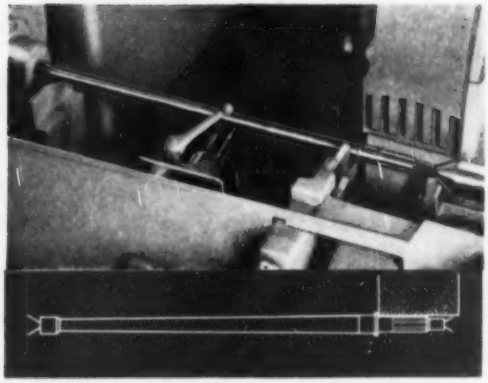
These are typical examples showing why cost conscious production men depend on modern Landis Grinders to lower cost per finished piece. Send prints of your work pieces for production and tooling estimates. Landis Tool Company, Waynesboro, Pennsylvania.

LANDIS

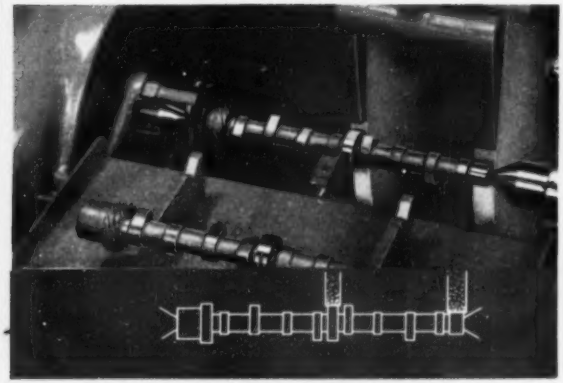
precision grinders



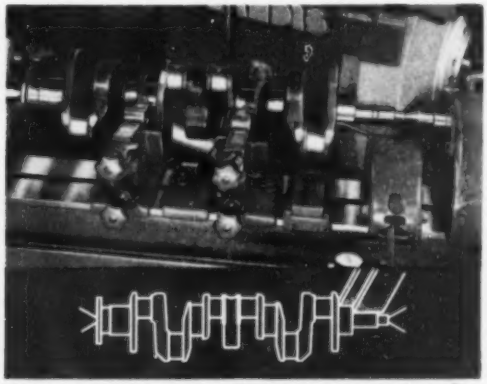
TWO DIAMETERS GROUND IN ONE OPERATION—by straight infeed with spaced wheels.



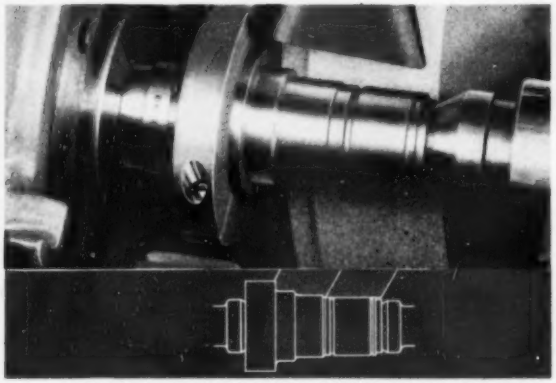
GRINDING DIAMETER AND ADJOINING RADIUS—in first operation. Second operation grinds adjoining diameter.



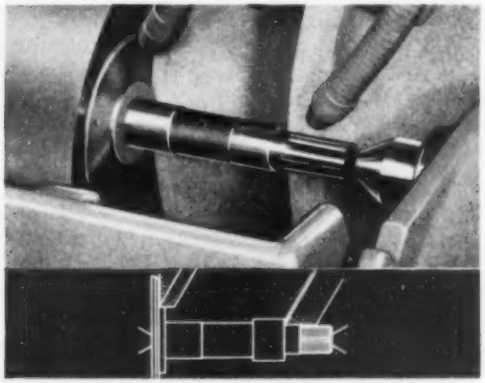
GRINDING TWO DIAMETERS IN ONE OPERATION—Straight infeed grinding with spaced wheels.



GRINDING END DIAMETERS AND FACE OF CRANKSHAFT—in one operation using spaced wheels on wheelbase set at 30° angle.



FACE AND THREE DIAMETERS GROUND IN ONE OPERATION—using a wide wheel, profile dressed and wheelbase set at 30°.



GRINDING TWO DIAMETERS WITH ADJOINING FACES—in one operation. Wheelbase set at 30°. Straight infeed grinding.

HYPRO features that lower unit costs—broaden work range!

G&L Double Housing Planers for extra-heavy and carbide tooling applications

These advanced features make G&L Double-Housing Planers the most modern development of their type for precision machining available anywhere.

Modern HYPRO planer construction shown here simplifies the most complex setups. It assures greater machine rigidity, accuracy and speed for extra-heavy applications and use of alloy and carbide tooling. Table widths — 36" to 120" allow full range of operations on both "normal" and massive size castings or weldments. Maximum feeds and speeds may be used regardless of amount of metal to be removed for rough and finish machining. Logical arrangement of all components, safety and operating controls assures smooth, convenient operation.

HYPRO planers have versatility to meet unusual production demands. To speed up overall operations, castings can be mounted in tandem. In this type of operation two rail heads and two side heads can be combined for multiple roughing cuts. This tandem arrangement saves tool set-up time . . . also insures precision alignment of bearing ways and accurate planing of all flat surfaces. This arrangement provides identical interchangeable work pieces.

Whether your work is simple or complex . . . large or small let these modern G&L HYPRO features work for you. Best way to find out how you can improve planing efficiency is to contact your nearest G&L representative. He'll tell you all about G&L's unbiased Job Analysis. Remember, there's no obligation . . . and DELIVERY ON G&L MACHINES MIGHT BE BETTER THAN YOU THINK!

Logical Grouping of Electrical and Safety Devices — assures most complete protection of machine and operator.

New HYPRO Pneumatic Tool Lifters — prolong tool life. Advanced cam and snubber design assure shockless tool block reseating without disturbing tool settings.

Patented Automatic Hydraulic Table Stop — protects against gear damage. Acts with a uniform decelerating motion without shock to planer in event of electrical or control failure. Eliminates "extras" — rack sections, cranes, etc.

Double-Length Enclosed Bed — extra depth through gear section for added strength, rigidity, smoother table travel.

GIDDINGS & LEWIS

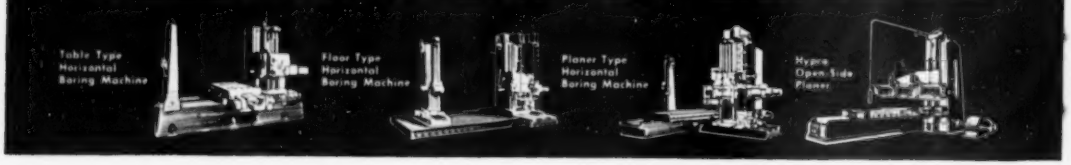
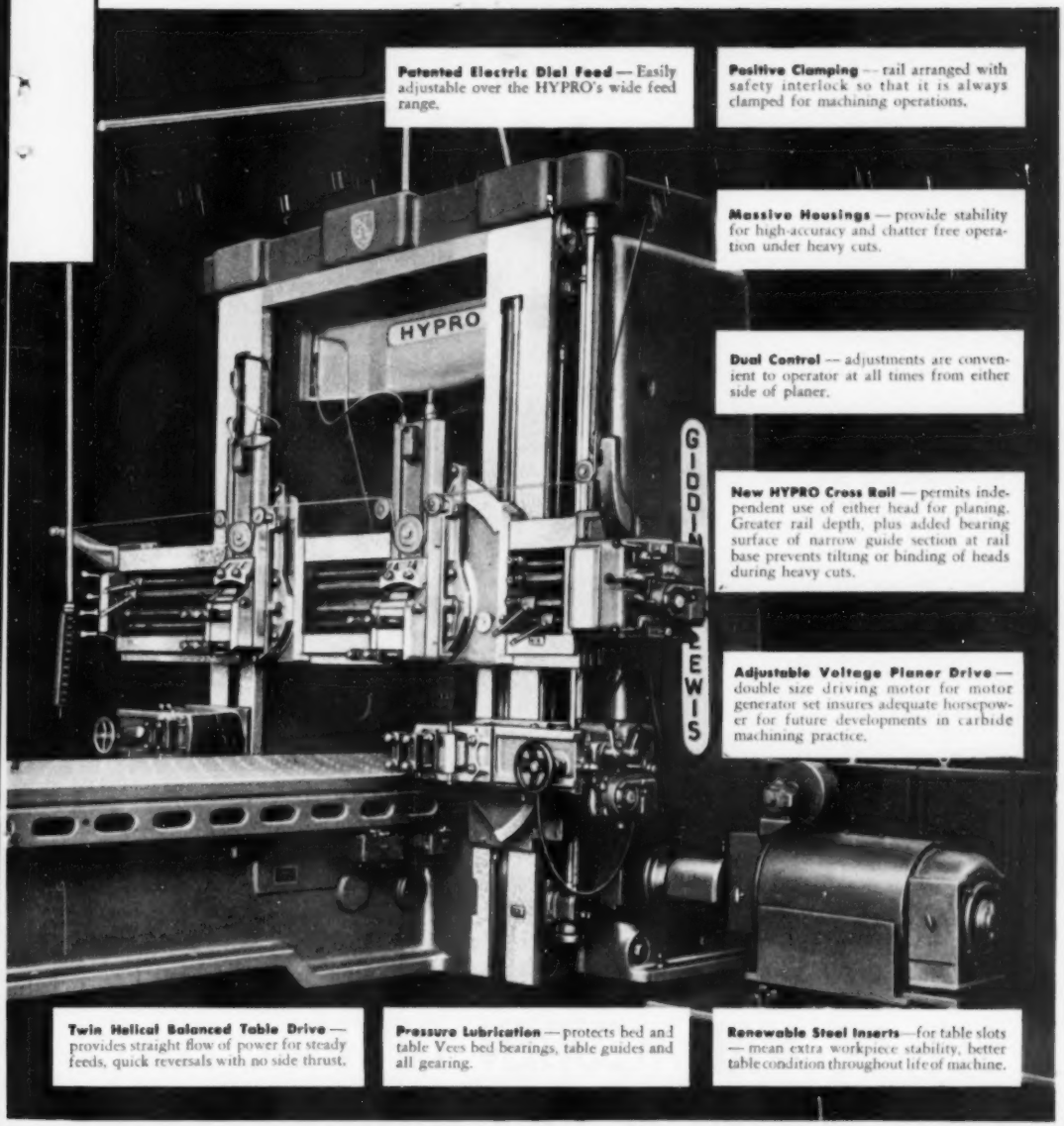


Table Type Horizontal Boring Machine
Floor Type Horizontal Boring Machine
Planer Type Horizontal Boring Machine
Hypro Open-Side Planer



Patented Electric Dial Feed — Easily adjustable over the HYPRO's wide feed range.

Positive Clamping — rail arranged with safety interlock so that it is always clamped for machining operations.

Massive Housings — provide stability for high-accuracy and chatter free operation under heavy cuts.

Dual Control — adjustments are convenient to operator at all times from either side of planer.

New HYPRO Cross Rail — permits independent use of either head for planing. Greater rail depth, plus added bearing surface of narrow guide section at rail base prevents tilting or binding of heads during heavy cuts.

Adjustable Voltage Planer Drive — double size driving motor for motor generator set insures adequate horsepower for future developments in carbide machining practice.

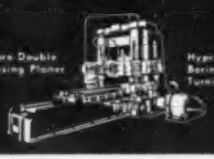
Twin Helical Balanced Table Drive — provides straight flow of power for steady feeds, quick reversals with no side thrust.

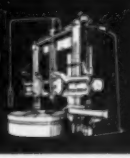
Pressure Lubrication — protects bed and table Vees bed bearings, table guides and all gearing.

Renewable Steel Inserts — for table slots — mean extra workpiece stability, better table condition throughout life of machine.

MACHINE TOOL CO.

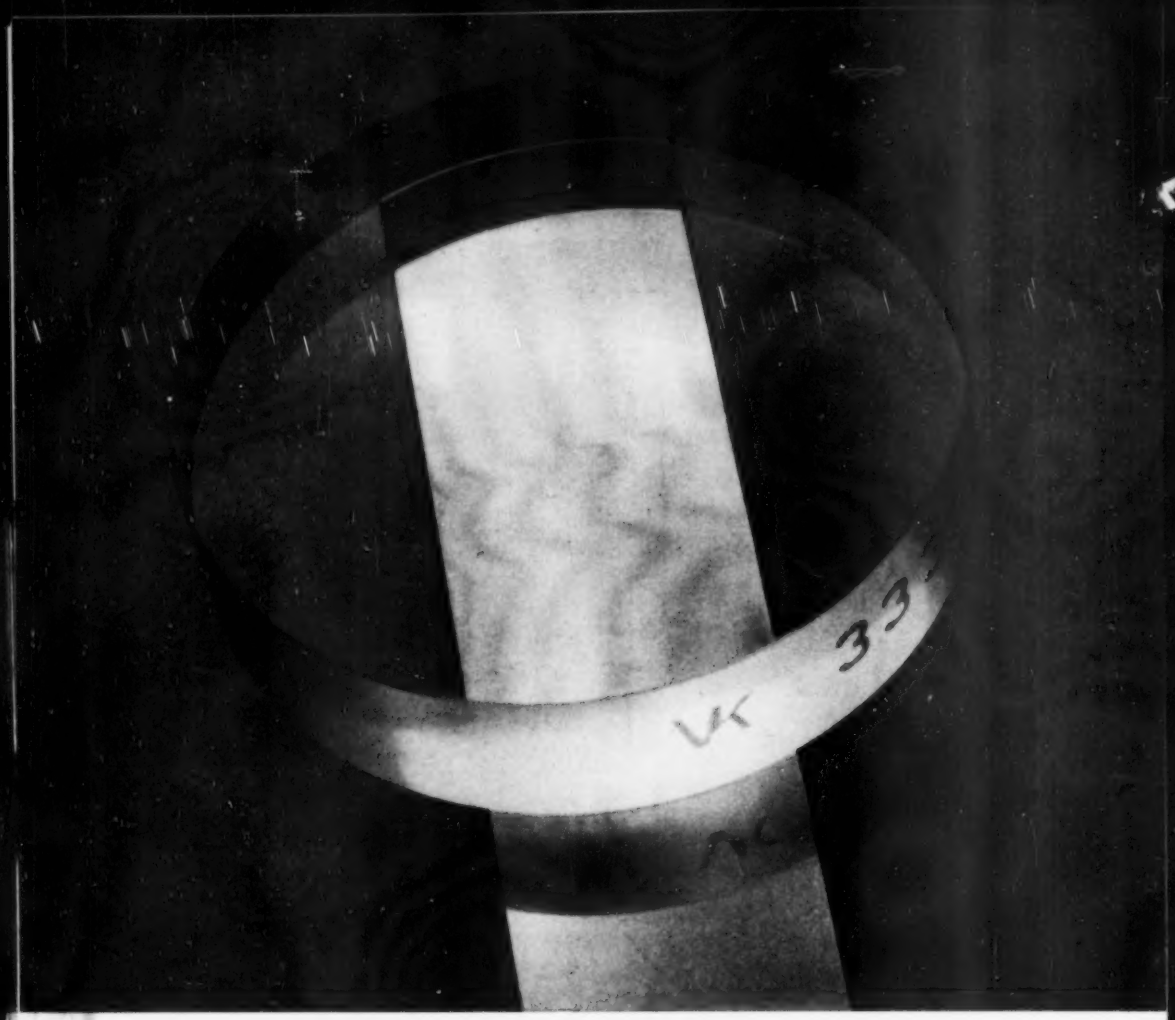
Hypro Planer Type Milling Machine


Hypro Double Housing Planer


Hypro Vertical Boring and Turning Mill

G&L HYPRO

FOND DU LAC
WISCONSIN



Two grooves each .00001" deep on an amplifying gage anvil.

Do your amplifying gages tell the truth?

A SET OF VAN KEUREN OPTICAL FLATS

will tell the story instantly

The Van Keuren 1952 Catalog and Handbook No. 35 gives complete details on testing flatness with optical flats and solutions of many other measuring problems.

Write for your copy.

THE *Van Keuren* CO.,

173 WALTHAM STREET, WATERTOWN, MASS.

33rd YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires

Why your machinery and motors last longer with LINK-BELT Fluid Drive's constant

CUSHION ACTION

IF YOUR MACHINE loads are of the high inertia, repetitive shock or high starting torque type, Link-Belt's Fluid Drives can save you money.

Constant CUSHION ACTION gives you the shock absorption and overload protection you need. More—because shock load service factors can be disregarded, you can use power transmission equipment of lower horsepower.

Check the three curves below. They demonstrate three exclusive advantages of CUSHION ACTION. And for more detailed information, write for Book 2485. In it you'll find all the facts on five types of Link-Belt Fluid Drives —Electrofluid Drive, Electrofluid Gearmotor, Fluid Drive, Fluid Gear Drive and Fluid Coupling Drive.

Cutaway shows simple, rugged construction of Link-Belt Fluid Drive.

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa), Sydney (Australia). Offices, Factory Branch Stores and Distributors in Principal Cities.

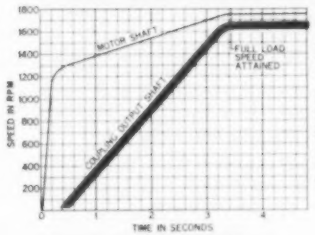
LINK-BELT

FLUID DRIVES

12,404

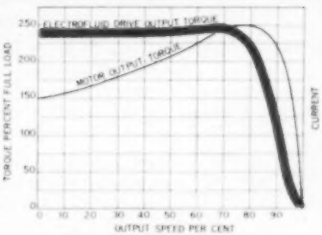
Here's proof

that LINK-BELT CUSHION ACTION offers you real savings . . .



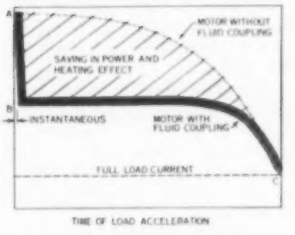
Smooth acceleration

Typical motor and coupling acceleration curves for a high-inertia load show how CUSHION ACTION smoothly and gradually accelerates the load, saving wear and tear on vital equipment.



No overmotoring

Compare the output torque of a motor with and without the fluid coupling. Because motor accelerates free of load, it reaches maximum pull-out torque that might otherwise require a special type of oversize motor.



Low starting current

As these current consumption curves show, with the fluid coupling, motor starting current drops instantaneously to less than half the starting current required by a motor without fluid coupling. Difference represents power savings, reduced heating.

Brand New

and

A STANDOUT FOR SPEED, CAPACITY AND TOP QUALITY LAPPING

Norton's Single Face Lapping Machine with Bonded Abrasive Laps Saves On Jobs Up to 60". . . A Sensational Performer Particularly On Soft Metals

Here's the greatest advancement ever made over old methods of lapping with loose abrasives. Norton's new single face, flat lapping machine combines a bonded abrasive lap with many other efficiency-boosting features to assure amazingly better, lower cost results.

You'll find these factors, plus ample capacity, make it the outstanding machine for lapping large castings of gray iron, aluminum, brass, magnesium and other soft metals. And on metals of every degree of hardness its faster, smoother performance will save you time and money throughout a long, trouble-free service life.

TYPICAL ADVANCED FEATURES

Hydraulic Pressure Device. Makes up for any lack of weight in work by applying correct compensating pressure for best lapping control.

Power Operated Truing Arm. Fully adjustable, providing slow to rapid traverse across lap. Simplifies maintenance of desired finish throughout the life of the lap.

Loadless Starting, Inertia Delay Clutch. Assures smooth pickup and even torque.

Automatic Operation. Requires only loading of machine and push-button starting to complete the electrically timed work cycle.

Large Capacity Range. Includes lap sizes of 48", and 60". Maximum size enables handling of three 24" pieces or one 60" piece (largest dimension).

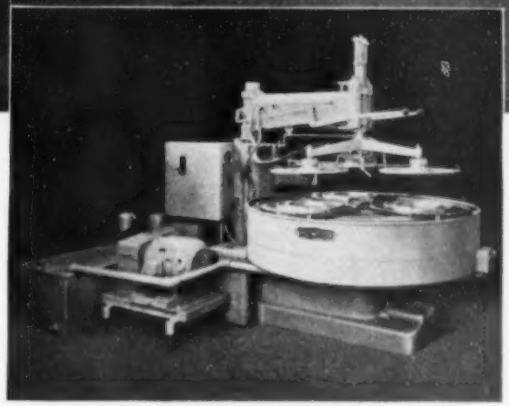
POSITIVE ADVANTAGES

Cleaner Work. Coated only by a thin, filtered oil, the surfaces finished by bonded abrasive lapping are free from the sludge left by loose abrasives.

Brighter Surfaces. Bonded abrasive lapping produces brighter surfaces on any metal, with no later polishing required.

Safer. By keeping the pores and crevices of the metal free from imbedded grit, the bonded abrasive enables

BONDED ABRASIVE LAPPING of aircraft engine housings reaches peak efficiency in the New Norton 60" Single Face Flat Lapping Machine. For faster stock removal, work is driven in opposite direction to its normal tendency to rotate.



HYDRAULIC PRESSURE DEVICE, shown in position, is used to apply additional lapping pressure for light work pieces.

safe lapping of soft metals to provide seal surfaces, wear surfaces, or surfaces for drilling or milling. This also eliminates the need of thorough cleaning after lapping, to rid surfaces of imbedded abrasive.

Faster. Cutting speed, on many materials, is 2 to 5 times faster than loose abrasive lapping for the same amount of stock removal.

More Accurate Products. The simple, positive laptruing device results in maximum product-accuracy on every job.

Greater Economy. Bonded abrasive laps are long-lasting and easy to replace. A low priced coolant is used. Inspection tools are subjected to less wear than on parts lapped with loose abrasives. Labor expenses for extra cleaning and polishing operations are eliminated. And with Norton laps made to match Norton machines exactly, you get an unbeatable cost-cutting combination.

FOR COMPLETE DETAILS

see your Norton Representative or write us direct.
NORTON COMPANY, Machine Division,
Worcester 6, Mass.

To Economize Modernize With **NEW**

NORTON

GRINDERS *and* LAPPERS

Making better products to make other products better

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CH MILLING SPEED, ACCURACY

Here's a job handled on a new CH-4 Machine

Job: Menasco Mfg. Co., Burbank, Calif. — Straddle Milling Drag Links

Machine: No. 4, Model CH, Plain Style

Part: Shock strut for landing gear cylinder

Cutters: High speed steel inserted tooth

Cutter Speed: 18 rpm, $\frac{15}{20}$ ipm feed

Chip Load: .005"

Material: 4140 Steel forging, 43 Rockwell

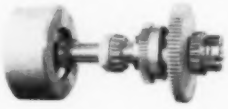
MACHINE COMBINES AND POWER

CH MILLING MACHINE FEATURES THAT HELPED DO THIS JOB BETTER

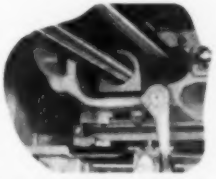
Speed range—*24* speed changes are provided from *15* to *1500* rpm. Automatic protecto-mesh mechanism permits nonclash shifting during speed changes.

Extra wide feed range — *32* changes from ⅜" to *90"* per minute meet requirements of new metals and cutting tools for most efficient operation.

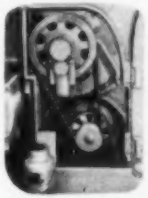
Greater rigidity — Entirely new column . . . heavily ribbed, box section, sponson construction . . . absorbs vibration from heaviest cutting loads.



Greater cutting efficiency through design refinements and a train of heavy duty, wide-faced, forged steel gears, hardened and specially processed for quiet operation.

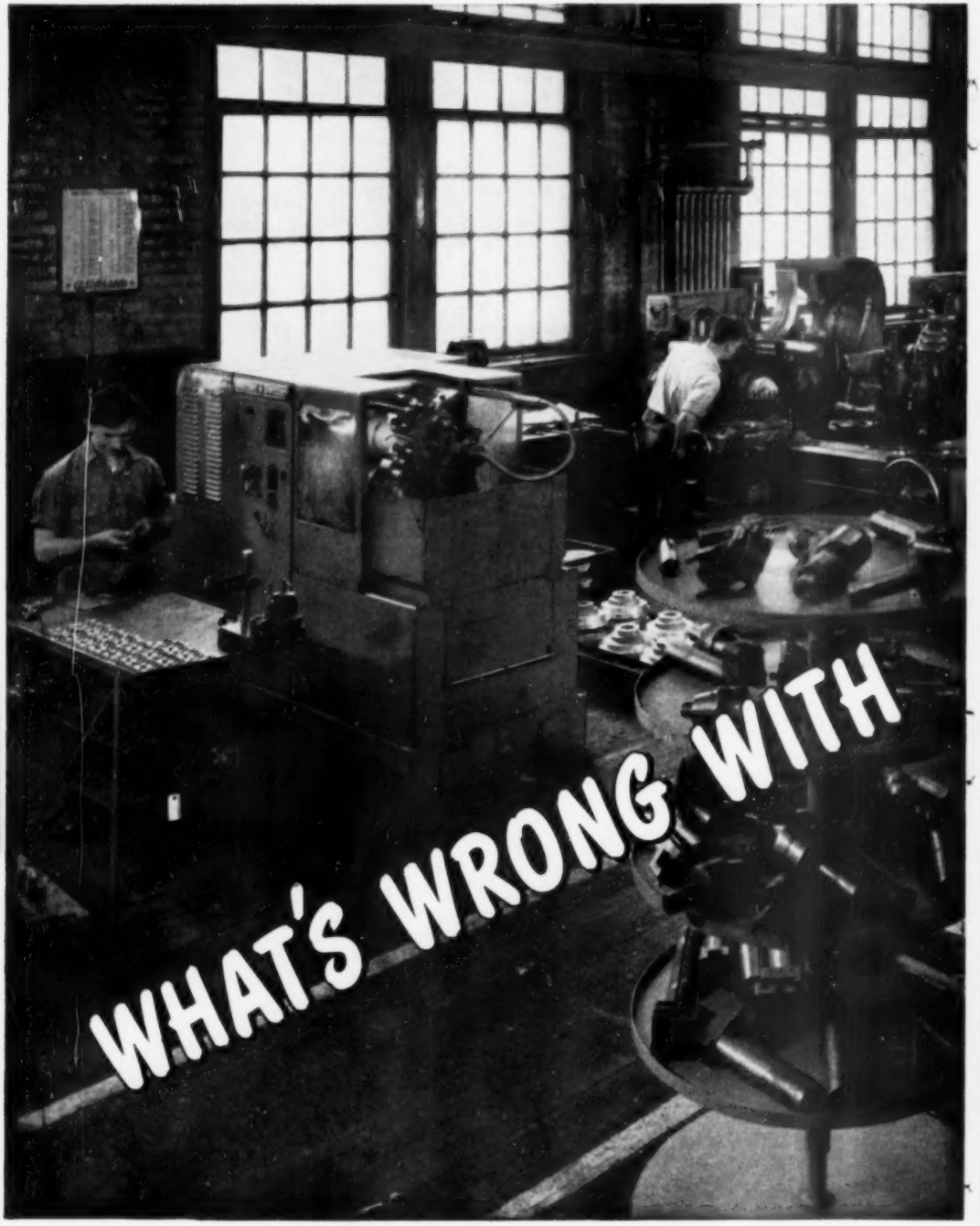


Smoother feed performance through a heavy duty *2"* dia. table feed screw. *23%* greater bearing contact between screw nut for longer screw life and accuracy.

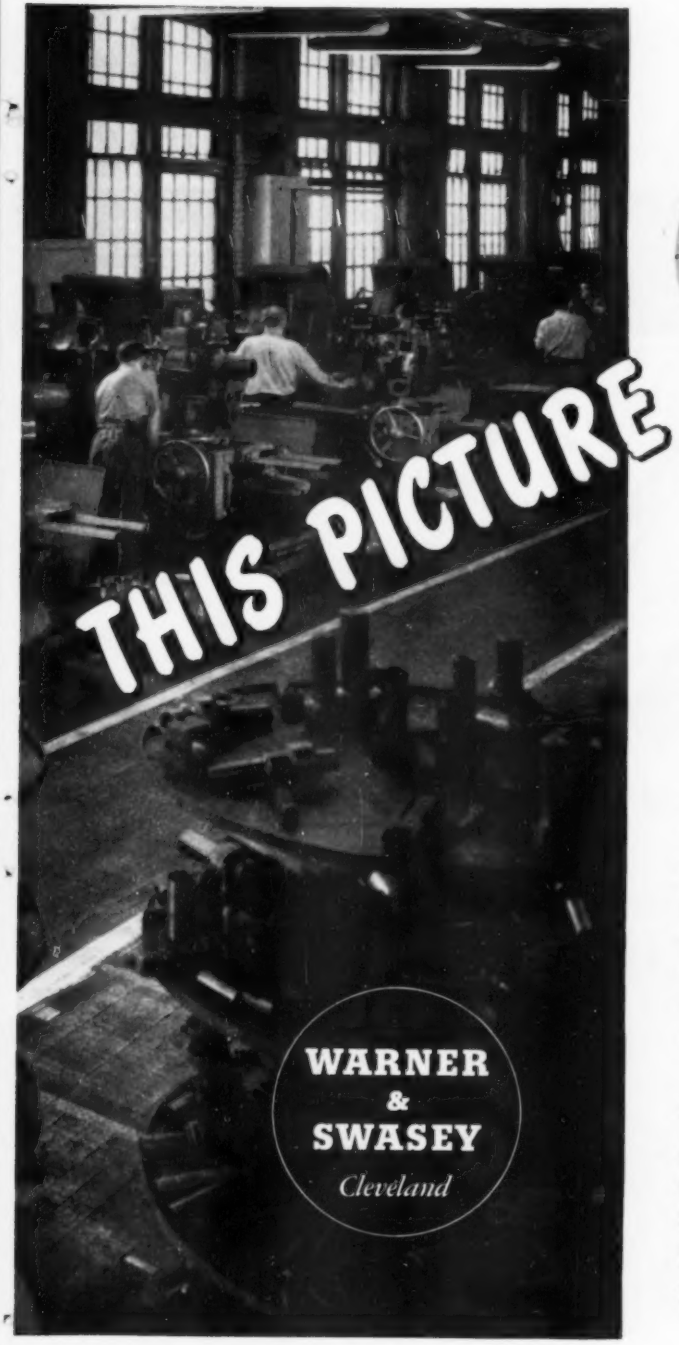


Greater horsepower through independent drives for spindle, feed and rapid traverse, and coolant. 15 hp delivered to spindle . . . *3* hp for feed and rapid traverse . . . ¼ hp for coolant.

INVESTIGATE the new CH line of milling machines. These and other features are job proven to give you cost-cutting results plus greater productivity, better finished products. Contact our nearest representative or write: Kearney & Trecker Corp., 6784 W. National Avenue, Milwaukee 14, Wisconsin.



YOU CAN MACHINE IT BETTER, FASTER, FOR LESS . . . WITH WARNER



Nothing at all! But chances are any veteran shop man will instantly ask, "What's the idea of having an 'Automatic' in the turret lathe department?"

The "idea" is simply this: Warner & Swasey 1-AC Single Spindle Automatics can handle many of your regular small and medium lot runs *more profitably* than your hand-operated machines.

That's because the 1-AC operator can change setups quickly for the job at hand. There are no cams to change—he simply re-adjusts trips for feed, speed and stroke controls. And, on certain jobs, one man on a 1-AC can turn out more work, of more uniform accuracy, than two men on hand-operated machines.

To find out whether 1-AC Single Spindle Automatics fit into your production picture, call in your nearest Warner & Swasey Field Representative. He'll study your jobs and methods and advise you correctly.

& SWASEY TURRET LATHES, AUTOMATICS AND TAPPING MACHINES

"Yessir . . . every cutting tool in

THE WORKS . . .

. . . is handled by our MORSE.

He Knows How to Cut Costs for Us with MORSE ELECTROLIZED TOOLS"

Here's the quickest way to cut production costs: Order the best cutting tools you can buy . . . Morse High Speed Tools, correctly specified for the job in hand. Then specify "MORSE ELECTROLIZED" . . . and you'll get many times more the wear-life than you ever got from *any* tools on that job before . . . as scores of leading metal-working plants have done, in the last 3 years.

Get in touch today with your Morse-Franchised Distributor . . . your *only* source of supply for Morse Electrolized Tools. He has the stock and the know-how to help you start cashing in *right now,* on real savings in production costs.

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Cutting Tools

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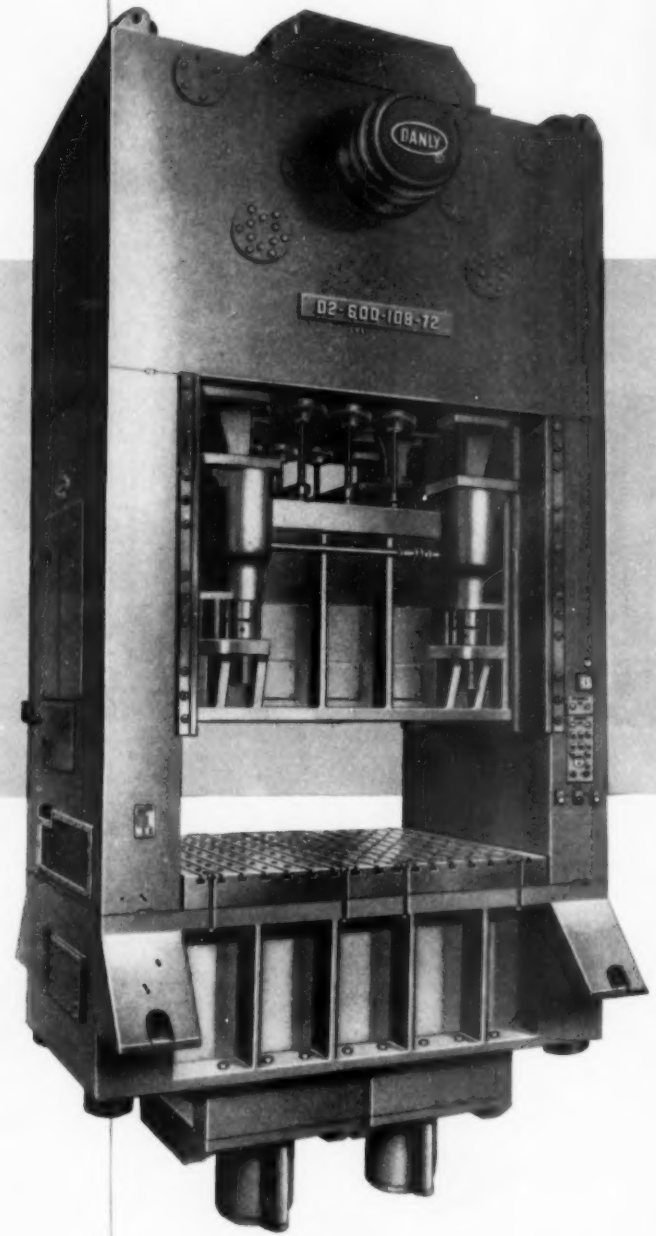
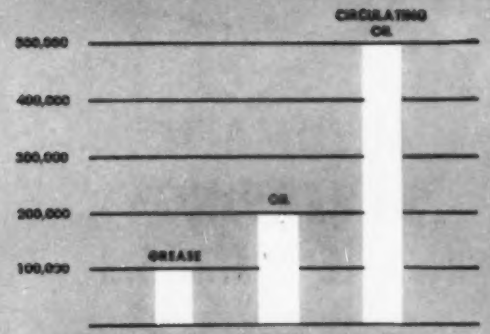
check your maintenance records!

DANLY



SAFEGUARDED BY AUTOMATIC OIL LUBRICATION
View of 600-ton Danly Double Action Press featuring automatic oil lubrication to all wear points. Pressure system permits automatic safeguards against lubrication failure.



CIRCULATING OIL GIVES GREATER PROTECTION

Chart showing superiority of circulating oil lubrication for anti-friction bearings. Values at left represent bore of bearing in millimeters multiplied by speed in rpm . . . an accepted method for expressing limits of efficient bearing operation.

PRESSES

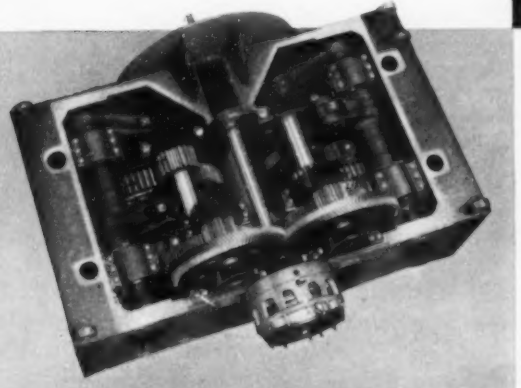
Actual day by day maintenance records in some of the country's biggest plants prove the importance of bearings in over-all press maintenance cost. The same records prove the cost advantages of Danly's automatic *circulating oil* lubrication system. Bearings wear longer because they run cooler and cleaner, continuously supplied with the proper amount of filtered oil lubrication.

Routine maintenance is reduced because periodic oiling or greasing is eliminated. The hazard of lubrication failure due to neglect or breakdown is eliminated by automatic safeguards. For the best in presses, come to DANLY.

DANLY

MECHANICAL PRESSES . . . 50 to 3000 TONS
HYDRAULIC METALWORKING EQUIPMENT

For complete details on outstanding Danly Press features . . . construction, drive, lubrication or operation . . . send for the Double Action Press Catalog today! Danly engineers are at your service.



CIRCULATING OIL TO ALL ANTI-FRICTION BEARINGS

Danly first and second intermediate shaft and drive shaft bearings, indicated in color in this exposed crown view are all anti-friction type, lubricated by filtered circulating oil. Cooler, cleaner operation prolongs life.

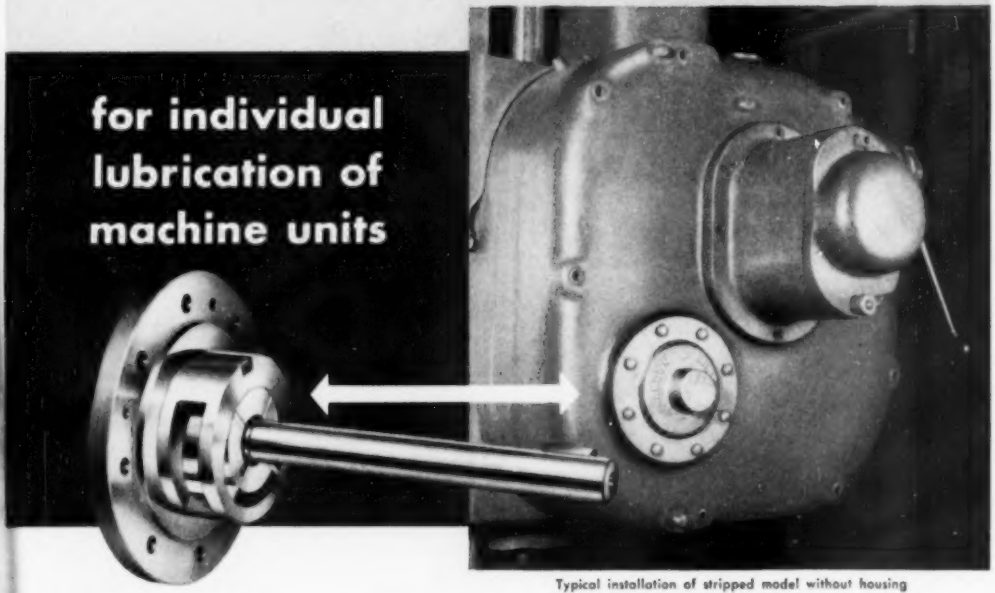
DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue, Chicago 50, Illinois

It costs less to run a DANLY PRESS!

Single Action Straight Side | Autofeed | Underdrive Single, Double Triple Action | Gap Frame | Double Action Straight Side

COMPACT AUTOMATIC REVERSING VANE PUMPS...

for individual lubrication of machine units



Typical installation of stripped model without housing in modern metal-working machine.

You get modern appearance when you equip machines with stripped models of Brown & Sharpe Automatic Reversing Vane Pumps. They're extremely compact . . . yet sturdily built for continuous, trouble-free service.

Brown & Sharpe *Stripped Models with housings* (Nos. 8022, 8062, and 8102) are very easily installed, particularly where internal discharge and suction ports are not readily incorporated in the machine design or when outside piping is desirable. *Stripped Models without housing* (Nos. 8023, 8063 and 8103) wherever installed, offer minimum projection from machine surfaces. Designed for use as integral parts of machines where suction and discharge ports can be incorporated in machine castings.

Fully-automatic reversing with unidirectional flow is a feature of all these pumps. Sizes available: 2½, 5 and 11½ g.p.m. at 0 lbs. pressure and at 1140 rpm. These and other features are fully described in Bulletin. Write Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.

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Visit Booth No. 1435
A. S. T. E. Show, Chicago.

Brown & Sharpe B·S

Hardened Tool Steel Vees

60 ROCKWELL C

protect the carriage ways of

"AMERICAN" PACEMAKER LATHES

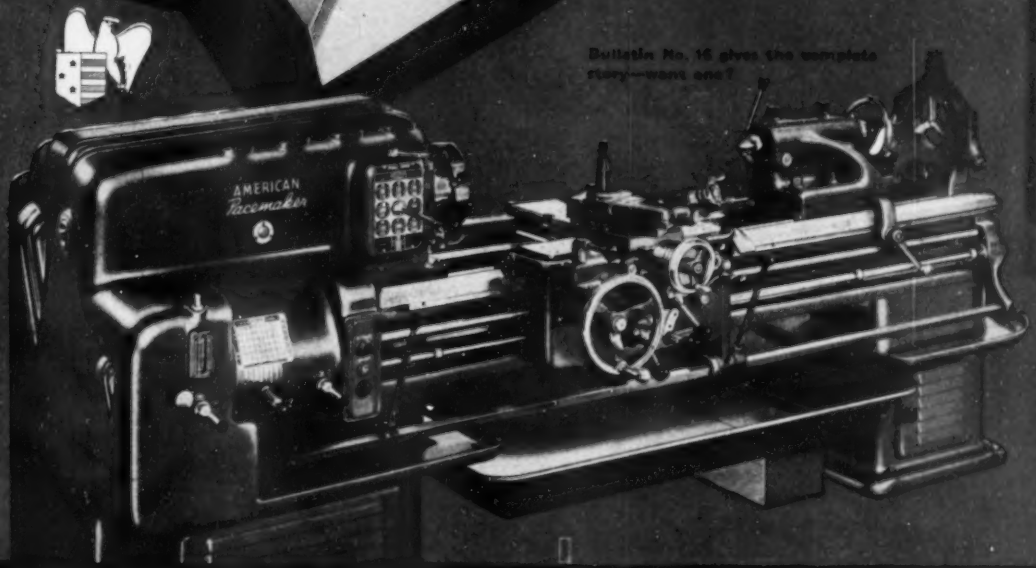
They are standard equipment on all "AMERICAN" Lathes

These hardened vees are made of solid tool steel and ground to close tolerances. No appreciable wear or replacement ever be required.

After hardening, the metallographic structure is stabilized by cold treatment at minus 100° Fahrenheit to prevent twisting or warping.

This feature is but one of the outstanding advantages offered by the new "AMERICAN" Pacemaker Lathe.

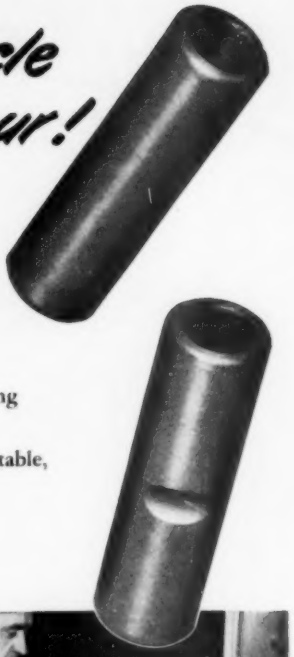
Bulletin No. 16 gives the complete story—want one?



THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

LATHES AND RADIAL DRILLS

Continuous, Automatic Cycle produces 1150 parts per hour!

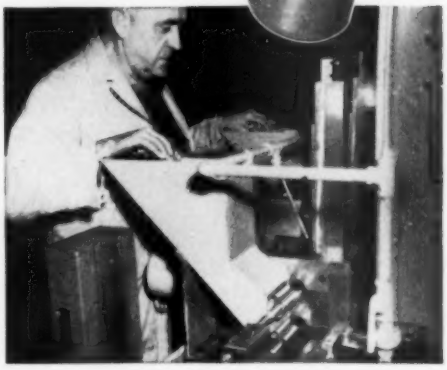


TYPICAL EXAMPLE OF HIGH PRODUCTION ENGINEERED THE *American* WAY

To broach radius notches in automotive piston pins, American engineers designed a ***completely automatic*** two station fixture featuring ***continuous cycling***. Each station broaches two parts. Installed on an American T-4-24 Broaching Machine, equipped with a special work table, this fixture permits broaching four parts simultaneously . . . produces more than 1150 parts per hour.

SIX AUTOMATIC OPERATIONS ENGINEERED IN CONTINUOUS CYCLE FIXTURE

The operator has only to keep the gravity-type loading hopper filled with parts. A transfer pusher pushes two parts at each station into position where they are hydraulically clamped in V nests. The main slide starts down broaching the four parts simultaneously. At the end of the stroke the transfer pushers push the part into a chute in the center of the machine where they are ejected. The transfer pushers and broaches return to the starting position and the cycle repeats. All operations are electrically interlocked.



SOLVE YOUR BROACHING PROBLEMS THE *American* WAY

Continuous, automatic cycling is only one way that American engineers help manufacturers get high production. Perhaps an American-engineered installation will increase production in your plant. To get American's recommendations send a part print or sample and hourly requirements.

AMERICAN *American* BROACH & MACHINE CO.
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.
ANN ARBOR, MICHIGAN

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See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

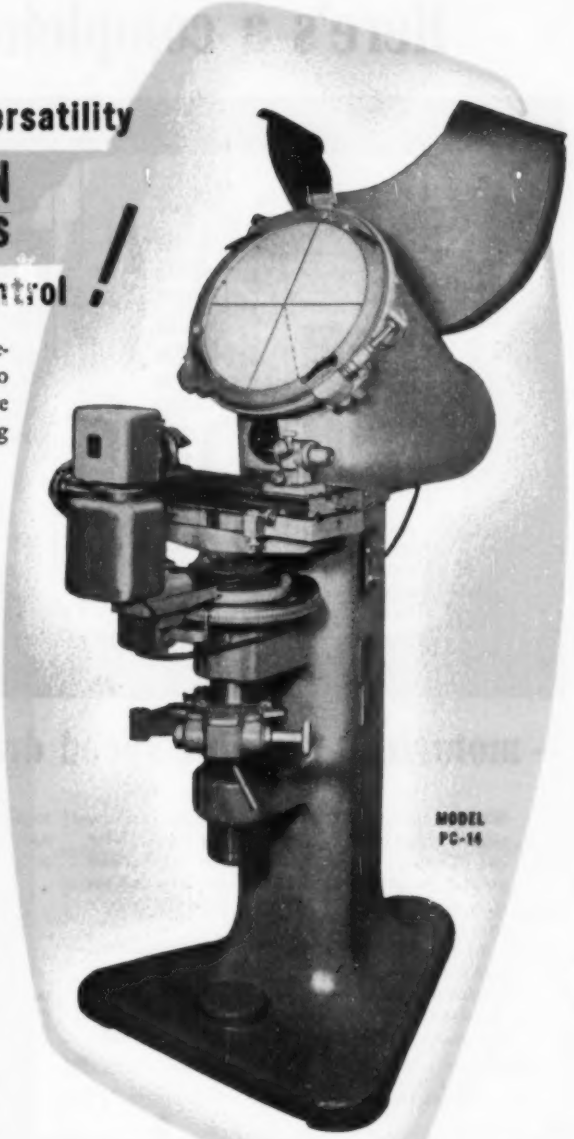
Unsurpassed Inspection Versatility

JONES & LAMSON
OPTICAL COMPARATORS

The Essence of Quality Control !

Jones & Lamson Optical Comparators are designed and built like rugged machine tools to withstand vibration and hard use. Yet they have the built-in accuracy to satisfy the most exacting laboratory standards.

- They meet the requirements of toolroom, laboratory and production inspection.
- They precisely measure height, depth, lead or spacing, as well as angles to degrees and minutes. They will measure to .0001".
- They compare intricately contoured parts with a master outline — and measure the amount of error.
- They are convenient to operate, easy to set up and read direct — *without computation.*
- They operate under normal lighting conditions. *No darkroom is needed.*
- They will photograph the enlarged shadow and record its relationship to a master chart.
- Several persons may study the shadow *at the same time.*
- They will inspect and measure surface contours, as well as profiles of objects such as type faces, stamping dies, punches, worn tools, etc.



MODEL PC-14

P.S. Jones & Lamson Comparators guarantee swift, sure QUALITY CONTROL *throughout your production lines.* Write Dept. 710 for Catalog No. 402. One of our ELEVEN models will fit your needs.

JONES & LAMSON
JONES & LAMSON MACHINE COMPANY
Springfield, Vermont, U.S.A.

Machine Tool Craftsmen Since 1835
COMPARATOR DIV.
Dept. 710

Jones & Lamson Machine Company
Springfield, Vt., U.S.A., Dept. 710
Please send Comparator Catalog No. 402.

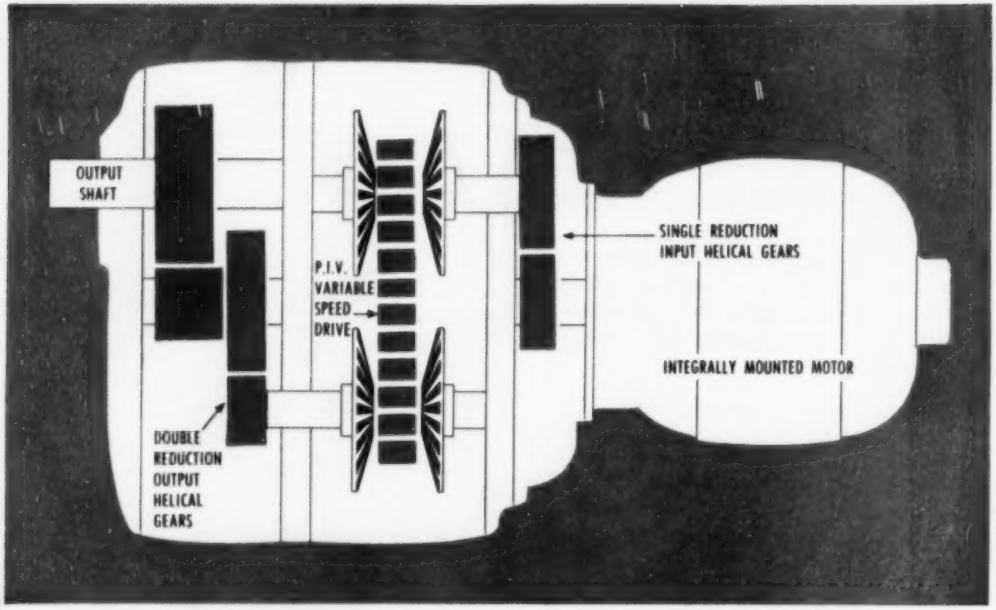
NAME _____ TITLE _____

COMPANY _____

STREET _____

CITY _____ STATE _____

Here's a complete package...



--motorized variable speed drive PLUS speed reducer

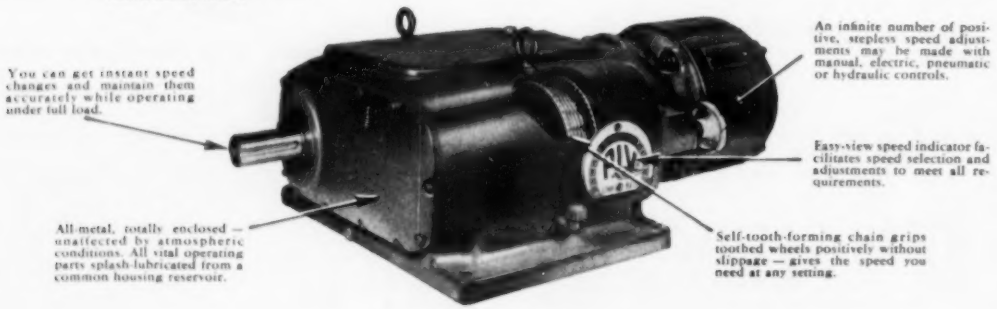
Whether your variable speed problem is simple or complex, Link-Belt's P.I.V. can increase the flexibility and efficiency of your machines. For this variable speed drive is not dependent on friction—you get exact speed selection in *positive*, infinitely variable settings.

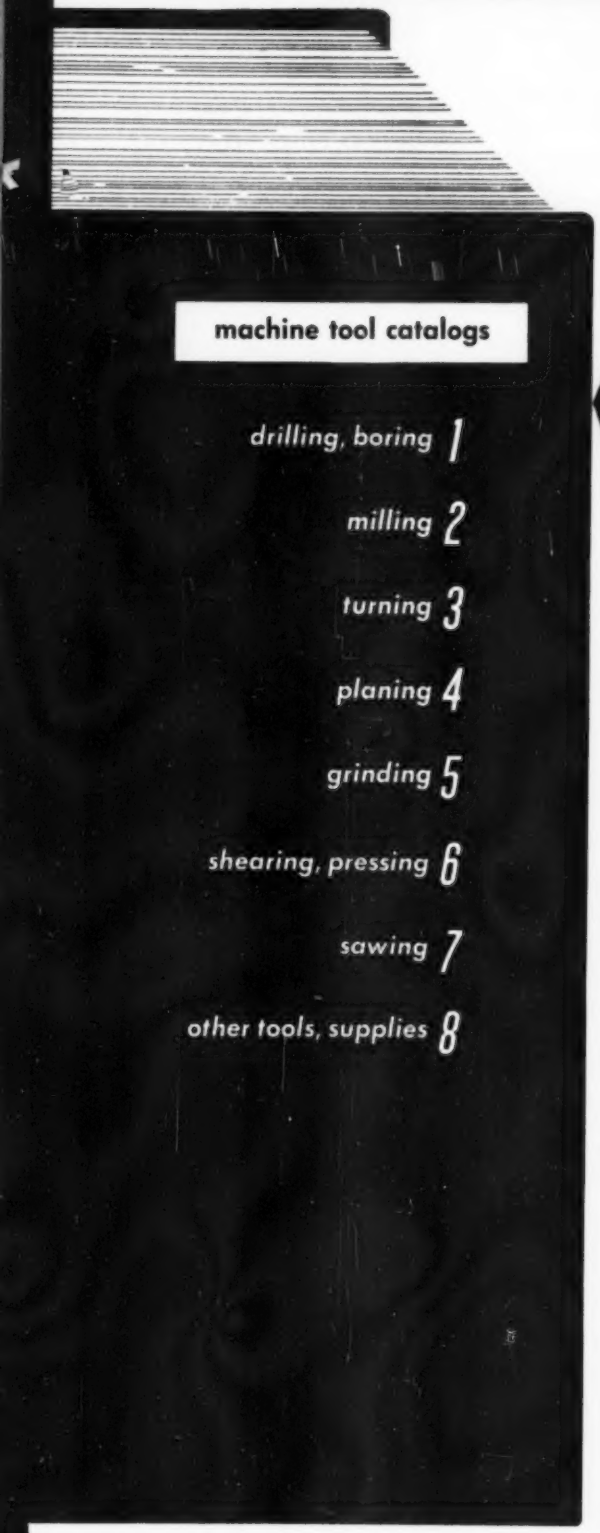
Shown here is the Model HMDG. Both input and output helical gears and the variable speed drive are lubricated from a common reservoir. This is just one of dozens of P.I.V. drives Link-Belt power transmission engineers can choose from to match your exact requirements. Available in 8 types—vertical or horizontal—with or without extra reduction gears—with or without motors.

LINK-BELT
P.I.V. VARIABLE SPEED DRIVE

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa), Sydney (Australia). Offices in Principal Cities. 12,540

ALL INDUSTRY USES P.I.V.*
*Positive, infinitely variable


You can get instant speed changes and maintain them accurately while operating under full load.
An infinite number of positive, stepless speed adjustments may be made with manual, electric, pneumatic or hydraulic controls.
Easy-view speed indicator facilitates speed selection and adjustments to meet all requirements.
All-metal, totally enclosed — unaffected by atmospheric conditions. All vital operating parts splash-lubricated from a common housing reservoir.
Self-tooth-forming chain grips toothed wheels positively without slippage — gives the speed you need at any setting.



now-

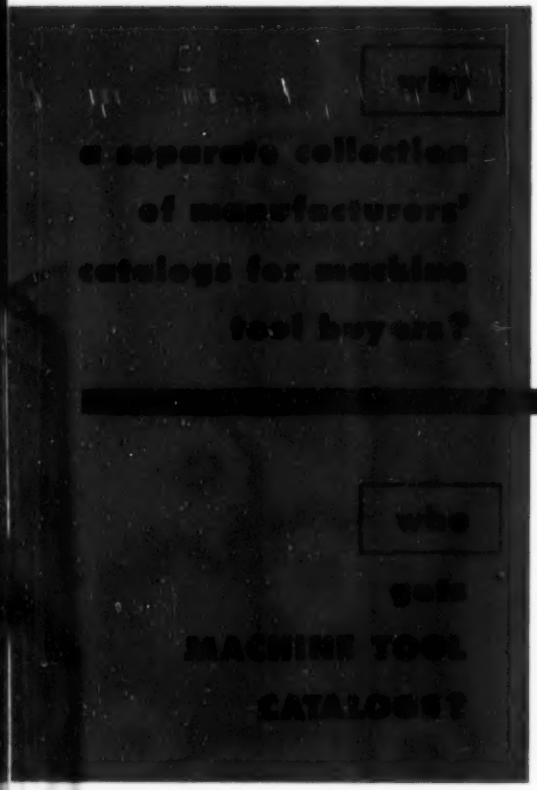
***a bound collection of manufacturers' catalogs assembled especially for* BUYERS OF MACHINE TOOLS AND ACCESSORIES**

FREE to qualified organizations and individuals

distribution starts November, 1952

Here, in easy-to-use form, are 82 manufacturers' catalogs and bulletins collected for the convenience of production men in 8,500 selected organizations. It contains 1,004 pages of essential buying information for production engineers and executives responsible for the selection and purchase of machine tools and accessory equipment.

MACHINE TOOL CATALOGS is organized, assembled, and distributed by *Sweet's Catalog Service.*



because the activities of the men directly responsible for efficient production center their product information needs upon *production equipment* . . . machine tools and accessories.

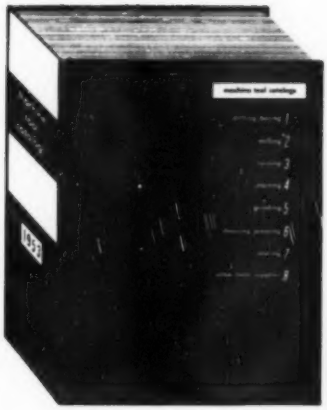
because many who build and sell machine tools have encouraged the development of MACHINE TOOL CATALOGS as a practical means of making their catalogs and bulletins instantly accessible to the men who need such information.

The manufacturers whose catalogs are assembled in MACHINE TOOL CATALOGS pay Sweet's Catalog Service to distribute them in this efficient and economical form without cost to eligible offices. Sweet's is obliged, under contract, to distribute MACHINE TOOL CATALOGS to organizations and individuals of highest potential buying power. Recipients of the File are selected impartially on the basis of minimum qualifications as regards size of company, nature of business and functions of individuals.

distribution schedule

classification	number of plants	approximate distribution
furniture and fixtures	150	200
fabricated metal products	2,000	2,500
machinery (except electrical)	2,600	3,200
electrical machinery	1,050	1,500
transportation equipment	900	1,650
instruments	350	450
miscellaneous	400	600
total manufacturing plants	**7,450**	**10,100**
railroad shops		200
schools and libraries		300
government offices		500
clients' checking copies		400
reserve for future "timed" distribution*		500
total		**12,000**

*Timed Distribution — Additional copies of the File will be forwarded throughout the year to production men in newly qualified plants. They need not wait for the next annual distribution.



manufacturers' catalogs are grouped in sections by types of equipment

1 — boring machines *(horizontal, jig, precision, vertical)*
drill presses *(automatic, multispindle, radial and vertical)*
honing machines
reaming machines
tapping machines

2 — *(bench type, horizontal, planer type, profiling and duplicating type, thread milling, universal, vertical)*

3 — *(automatic chucking, automatic screw, bench, boring, combination boring and turning, threading, toolroom, turret)*

4 — broaching machines *(horizontal—internal and surface, vertical—internal and surface)*
gear shaping machines
planers *(double housing, openside, plate)*
shapers

5 — *(bench, floor, buffing, cylindrical—internal, cylindrical—external, disc, lapping, polishing, surface—rotary, surface—reciprocating, thread, tool and cutter)*

6 — bending machines *(bending brakes, bending rolls, rotary head, ram type)*
presses—hydraulic and pneumatic *(horizontal, vertical, combination)*
presses—mechanical *(bulldozers, double and triple acting, horizontal, inclinable, vertical, vertical—gap or C frame, vertical—adjustable bed and horning)*
punches
shears *(bar and angle, combination, plate, rotary)*

7 — circular, reciprocating, band

8 — attachments
accessories
cutting tools
gages
heat treating
welding, brazing, hardening

information you need . . . always at hand

This collection of 82 catalogs and bulletins totaling 1,904 pages contains useful information on a wide range of machine tools and accessories. It is classified and indexed so that products are easy to find and easy to compare.

The following manufacturers have contracted to have current catalogs or bulletins for machine tool buyers bound together in MACHINE TOOL CATALOGS *for 1953:*

Abrasive Machine Tool Co.
Acme Steel Co.
Anderson Bros. Mfg. Co.
Armstrong-Blum Mfg. Co.
Armstrong Bros. Tool Co.
Arter Grinding Machine Co.
Baldwin-Lima-Hamilton Corp.
Bausch & Lomb Optical Co.
Brown & Sharpe Mfg. Co.
Bryant Chucking Grinder Co.
Bullard Co.
Burg Tool Manufacturing Co.
Carlton Machine Tool Co.
Cincinnati Gilbert Machine Tool Co.
Cincinnati Milling Machine Co.
Cleveland Crane & Engineering Co., Steelweld Div.
Consolidated Machine Tool Corp.
Crane Packing Co.
Dake Engine Co.
Davis & Thompson Co.
Famco Machine Co.
Federal Products Corp.
Fosdick Machine Tool Co.
C. Allen Fulmer Co.
Giddings & Lewis Machine Tool Co.
Gisholt Machine Co.
Gleason Works
Greenlee Bros. & Co.
H. E. B. Machine Tools, Inc.
Hall Planetary Co.
Heald Machine Co.
Hydro-Borer Co.
Johnson Machine & Press Corp.
Jones & Lamson Machine Co.
Kaukauna Machine Corp.
Kearney & Trecker Corp.
Kent-Owens Machine Co.
James H. Knapp Co.
W. B. Knight Machinery Co.
Landis Tool Co.
La Pointe Machine Tool Co.
R. K. Le Blond Machine Tool Co.
Louis Levin & Son, Inc.
Lucas Machine Div., New Britain Machine Co.
Monarch Machine Tool Co.
Moore Special Tool Co.
Morey Machinery Co., Inc.
Motch & Merryweather Machinery Co.
National Automatic Tool Co.
National Conveyors Co., Inc.
Nebel Machine Tool Co.
New Britain-Gridley Div. New Britain Machine Co.
Nichols-Morris Corp.
Norton Co.
Ohio Crankshaft Co.
Oliver Instrument Co.
O'Neil-Irwin Mfg. Co.
Peerless Machine Co.
Plan-O-Mill Corp.
Reed Rolled Thread Die Co.
Reid Brothers Co., Inc.
Rowbottom Machine Co., Inc.
Sciaky Bros., Inc.
Seneca Falls Machine Co.
Sheffield Corp.
Sheldon Machine Co., Inc.
Sidney Machine Tool Co.
Smith & Mills Co.
Snyder Tool & Engineering Co.
Sundstrand Machine Tool Co.
Taft-Peirce Manufacturing Co.
Thomas Machine Manufacturing Co.
Torit Manufacturing Co.
Van Norman Co.
Verson Allsteel Press Co.
Wade Tool Co.
Wales-Strippit Corp.
Warner & Swasey Co.
Wells Mfg. Corp.

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designers, producers and distributors of manufacturers' market-specialized catalogs

DIVISION OF F. W. DODGE CORPORATION

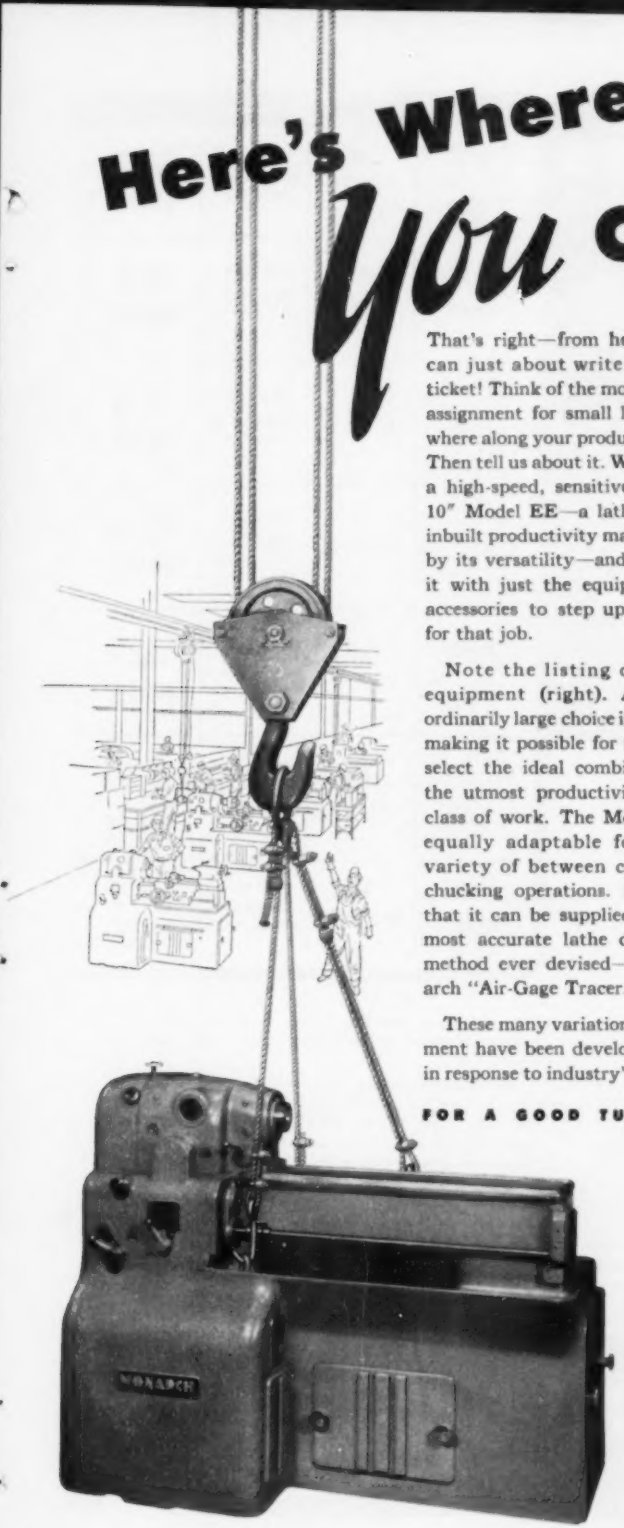
119 WEST 40TH STREET, NEW YORK 18, N. Y.

Here's Where *You* Come In!

That's right—from here on you can just about write your own ticket! Think of the most exacting assignment for small lathes anywhere along your production lines. Then tell us about it. We'll deliver a high-speed, sensitive Monarch 10″ Model EE—a lathe with an inbuilt productivity matched only by its versatility—and you'll get it with just the equipment and accessories to step up standards for that job.

Note the listing of typical equipment (right). An extraordinarily large choice is available, making it possible for the user to select the ideal combination for the utmost productivity on *his* class of work. The Model EE is equally adaptable for a wide variety of between center and chucking operations. Note, too, that it can be supplied with the most accurate lathe duplicating method ever devised—the Monarch "Air-Gage Tracer."

These many variations in equipment have been developed solely in response to industry's demands that we make the basic Model EE design available for constantly widening uses. Could anything we say speak better for its design and specifications? Some place—*many* places, perhaps—this outstanding Monarch lathe can improve your production at lower cost. Send the coupon today for full details . . . . . *The Monarch Machine Tool Company, Sidney, Ohio.*



TYPICAL EQUIPMENT

- "Air-Gage Tracer"
- Steady rest
- Follow rest
- Taper turning attachment
- Collet attachments
- Air equipment
- Bar feed attachments
- Collet chucks
- Jaw chucks
- Step chucks
- Stops
- Micro-gaging diameter dial
- Hexagon power feed bed turret
- Hand operated cut-off slide
- Variable feed control
- Ball turning rest

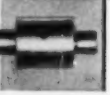
FOR A GOOD TURN FASTER . . . TURN TO MONARCH

Monarch
ACCURACY • ECONOMY • LONG LIFE
TURNING MACHINES

THE MONARCH MACHINE TOOL CO., Sidney, Ohio

Gentlemen:
Please send me without obligation your Booklet No. 1003 covering the Monarch Precision Manufacturing Lathe—Model EE. *(It's that new one with 28 pages and a host of those sparkling Monarch illustrations.)*

NAME _____
COMPANY _____ TITLE _____
ADDRESS _____
CITY _____ ZONE ____ STATE _____

	19 1⅛"–2⅜"	14.0 MIN. (Hand Screw Machine)	9.5 MIN.
	32 1"–2¾"	5.0 MIN. (Old Style S. S. Automatic)	3.7 MIN.
	12 2½" DIA.	15.0 MIN. (Hand Screw Machine)	5.4 MIN.
	5 2¼" LONG	20.2 MIN. (Hand Screw Machine)	12.0 MIN.
	16 1¾₆"–2⅜₆"	11.0 MIN. (Hand Screw Machine)	7.0 MIN.
	10 2" DIA.	7.5 MIN. (Hand Screw Machine)	3.2 MIN.
	16 4¼" LONG	27.0 MIN. (Hand Screw Machine)	12.5 MIN.

500 PIECES
IN THE BIN...FOR THE COST OF 100!

The Acme-Gridley Model M Single Spindle Automatic Bar Machine cuts costs on small-lot work—and speeds production, too.

That's the customer-documented experience of The Elliott Company, in their Springfield, Ohio plant. The figures in the table above are their own—as is the statement of cost saving. They further state that these savings will recover cost of the machine in three years.

Notice the wide variety of parts, and the uniformly faster machining times on each—an average production increase of 87%. But faster production and versatility are only part of the story. Additional savings—in machine and tool investment, in floor space, in man hours—go to make up the five-to-one reduction in production costs realized by The Elliott Co.

All of these are the direct results of inherent design features of the Model M: wide, open tooling zones, for easy access; heavy, rigid frame construction, to permit the use of carbide tools; simple camming, for quick change-over; three automatic spindle speed ranges, for most efficient cutting; independent camming for the eight tool slides, to permit combining cuts—these and many more.

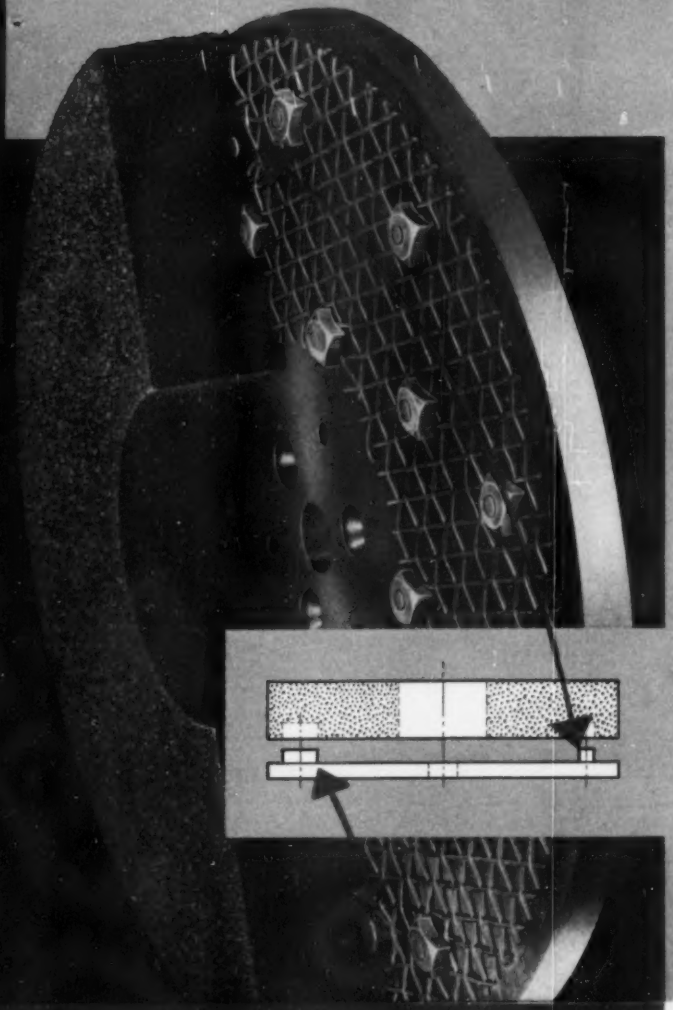
Learn about them in Bulletin M-50, your guide to lower machining costs on small-lot work.

The NATIONAL ACME CO.
170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids • Centrifuges • Contract Manufacturing

Compare the Grinding Precision

of This Abrasive Disc With Other Makes



Grinding to close tolerances is no problem with Gardner abrasives. Precision work is made easier because factory trueness is maintained throughout the entire life of the disc.

On Gardner discs provided with the Tru-Lok feature, it's impossible to make an off center mounting. On job after job maintaining trueness assures better finishes and closer tolerances. Doweled Tru-Lok mounting aligns the holes in the abrasive and the steel wheel.

This exclusive Gardner feature is another reason why Gardner Abrasive Discs are first choice among users of flat surface grinders. New Gardner grinders are equipped with the Tru-Lok feature. It can also be made available for older machines.

Gardner engineers abrasive discs to fit specific grinding requirements. For help with your surface grinding problems, call the nearest representative in our nation-wide service organization.

GARDNER

abrasive discs

Service Book Department
GARDNER MACHINE COMPANY
Beloit, Wisconsin 107A

Please send me the Gardner Guidebook for Surface Grinding.

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TITLE _____

COMPANY _____

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CITY _____ ZONE _____ STATE _____

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NATIONAL

TOOLS

Your demands for utmost performance, economy, and dependability in cutting tools are met in the complete NATIONAL line, including Twist Drills, Reamers, Counterbores, Milling Cutters, End Mills, Hobs, and Special Tools. Each carries the NATIONAL name, long famous for sound engineering and skilled craftsmanship.

NATIONAL TWIST DRILL AND TOOL COMPANY
Rochester Michigan U. S. A.

Distributors in principal cities. Factory Branches: New York, Chicago, Detroit, Dallas, San Francisco.

CALL YOUR INDUSTRIAL SUPPLY DISTRIBUTOR

for all your staple industrial needs, including NATIONAL Twist Drills, Reamers, Counterbores, Milling Cutters, End Mills, Hobs, and Special Tools.

WHAT'S THE BEST WAY TO STRIP PAINT FROM METAL PARTS TOO LARGE TO BE SOAKED IN TANKS?
See Page 3
OAKITE'S New FREE Booklet on Paint Stripping
how to STRIP PAINT
with Oakite Materials & Methods

OAKITE PRODUCTS, INC.
26 Thames St., New York 6, N. Y.

Send me a copy of your booklet *"How to STRIP PAINT"*

Also tell me (without obligation) about Oakite methods for the following jobs.

- ☐ Tank cleaning
- ☐ Machine cleaning
- ☐ Electrocleaning
- ☐ Pickling
- ☐ Pre-paint treatment
- ☐ Steam-detergent cleaning
- ☐ Burnishing
- ☐ Rust prevention

NAME_____

COMPANY_____

ADDRESS_____

_____

answers many questions that will lead you to better stripping procedures. You'll want to read more about:

What's the best way to strip large areas of structural metal where a steam supply is available? *See page 5.*

What is the best method when steam is not available? *See page 7.*

What is the cheapest way to strip metal parts in large volume? *See page 9.*

What are the best ways to prepare stripped surfaces for repainting? *See page 11.*

What strippers are best for removing oil-base paints? . . . Synthetic enamels, alkali-resistant plastics or resin-based paints? . . . Japans, wrinkle finishes, nitrocellulose lacquers, alkyds, phenolics and ureas? *See page 12.*

FREE For a copy of "How to STRIP PAINT" write to Oakite Products, Inc., 26 Thames St., New York 6, N. Y. This well-illustrated booklet describes four money-saving ways to remove paint:

1. **Oakite Steam Gun Method**
2. **Oakite Hot Flow-On Method**
3. **Oakite Cold Spray Method**
4. **Oakite Tank Immersion Method**

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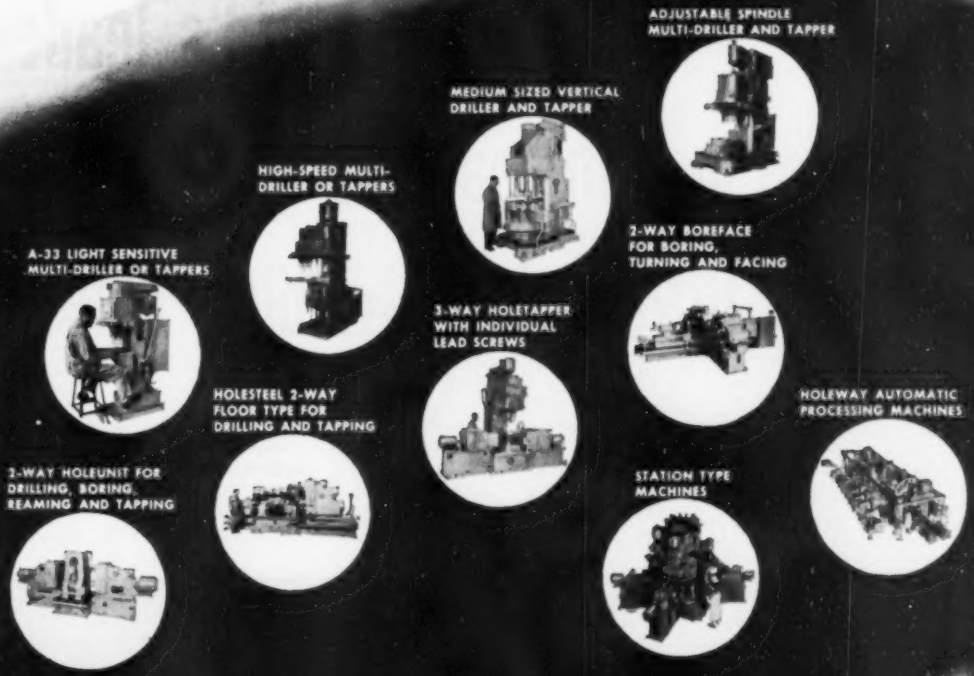
ADJUSTABLE SPINDLE MULTI-DRILLER AND TAPPER
MEDIUM SIZED VERTICAL DRILLER AND TAPPER
HIGH-SPEED MULTI-DRILLER OR TAPPERS
A-33 LIGHT SENSITIVE MULTI-DRILLER OR TAPPERS
2-WAY BOREFACE FOR BORING, TURNING AND FACING
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HOLEWAY AUTOMATIC PROCESSING MACHINES
2-WAY HOLEUNIT FOR DRILLING, BORING, REAMING AND TAPPING
STATION TYPE MACHINES

multi-

...ines ... from

...ts ... from 1/16 inch

...ials worked include iron, steel,

...d wood. Call a NATCO Field Engineer.

Call a Natco Field Engineer

To help you solve your problems in
Drilling, Tapping, Boring & Facing.

NATCO

NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

Branch Offices

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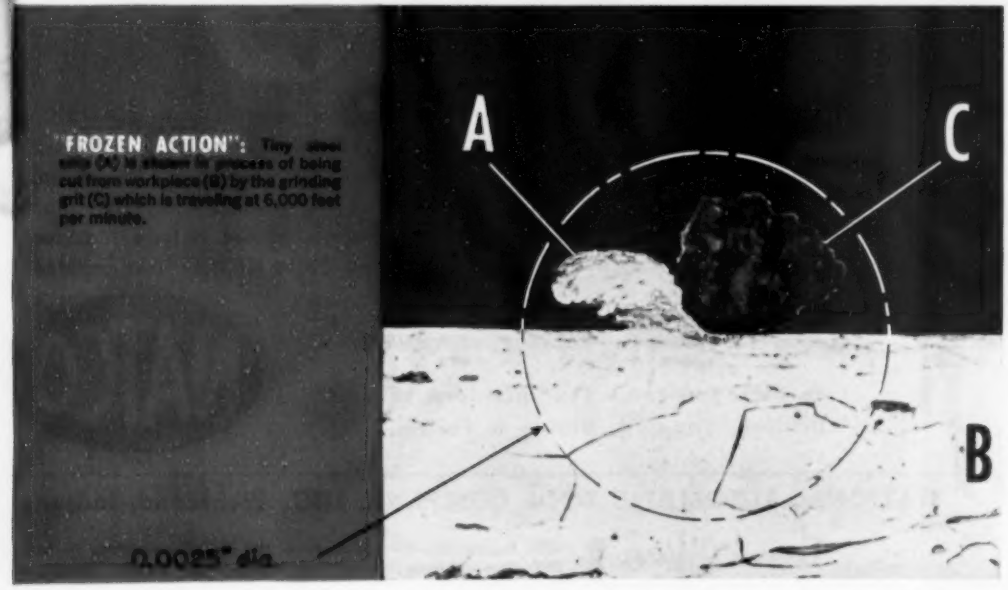
1907 Elmwood Ave., BUFFALO • 2902 Commerce Bldg., NEW YORK CITY

Basic new concept by world's leader in machine tools led to CINCINNATI Grinding Wheels

FRANK RECOGNITION of the grinding wheel as a *cutting tool* has led to a new approach in Cincinnati Grinding Wheels. Through 25 years of research in chip formation, Cincinnati Milling has proved that the grinding process is a true metal cutting process. The grinding grits do not abrade or wear away the surface of a workpiece but form chips which agree in classification with the basic chip types found in other metal cutting processes.

This new concept is the beginning of a

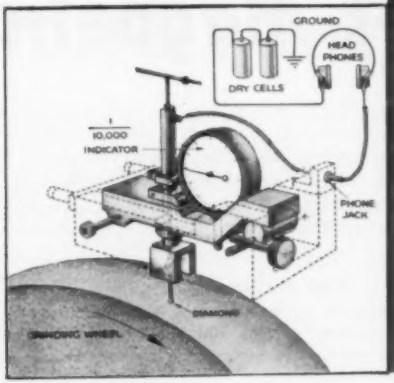


"FROZEN ACTION": Tiny steel wire (A) is shown in process of being cut from workpiece (B) by the grinding grit (C) which is traveling at 6,000 feet per minute.

whole new approach to grinding wheels—the development of the grinding wheel as a true cutting tool. And it is a development you might expect from Cincinnati Milling, with the world's largest background of research and experience in metal cutting operations.

For you, this means grinding wheels developed and tested over a period of several years on the basis of true function—as true cutting tools forming true chips.

Available to you is a field organization of trained machinists who know grinding and grinding machines as well as grinding wheels. For a demonstration on your own machines of how to get the most out of Cincinnati Grinding Wheels, just write, wire or phone Cincinnati Milling Products Division, The Cincinnati Milling Machine Company.

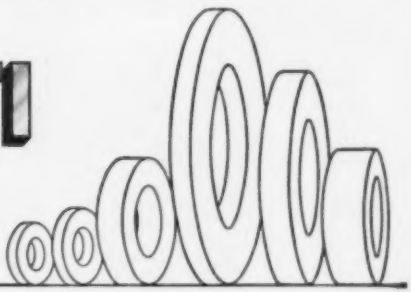


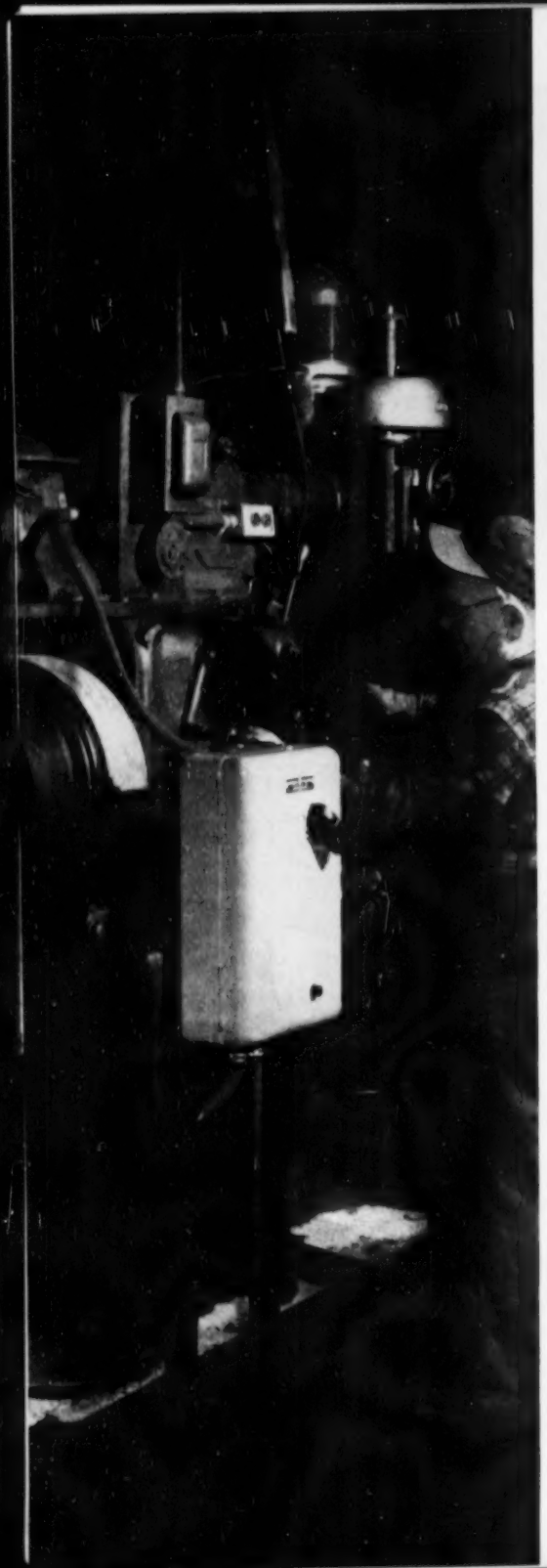
TRUE VALUES [illegible] of grinding wheel wear are obtained by equipment which gives consistent measurement of changes in wheel radius within .00005".

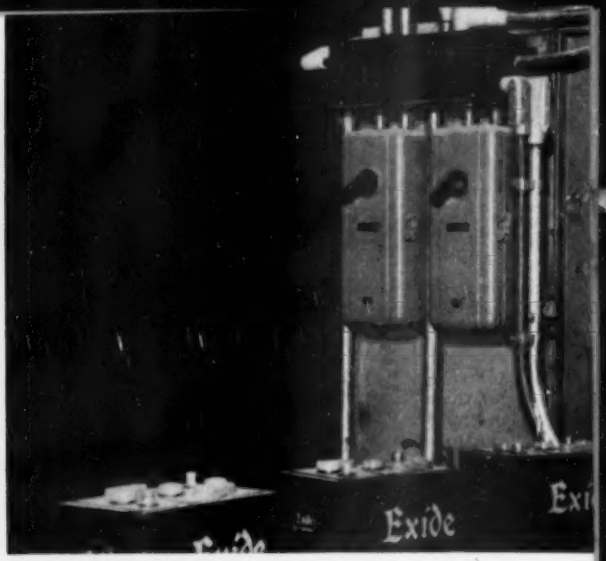
DIAGRAM [illegible] the instrument which was developed by Cincinnati Milling to determine the true value of wheel wear by accurate measure of the wheel itself.

FREE BOOKLET. Just off the presses is a brand new booklet entitled "A New Concept In Grinding Wheels." It's packed with important information for anyone interested in grinding operations. A copy is yours for the asking. Just write Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, O.

CINCINNATI
Grinding Wheels
THE CINCINNATI MILLING MACHINE CO.
Cincinnati 9, Ohio







◀ **NICKELPLATE ROAD** has been modernizing their shop at Brewster, Ohio. One example: on an existing milling machine, left, a new G-E motor and a G-E full-voltage, combination magnetic motor starter assure top production. Their maintenance men say, "This G-E starter takes plenty of abuse and is easy to maintain."

Three more leading "G-E Magnetic

Nickelplate Road, The Electric Storage Battery Co. and Electro-Lift, Inc. have joined the thousands of companies who use G-E magnetic motor starters to maintain top production.

They know that dependable G-E starters give longer-lasting protection against shutdowns. Exclusive G-E features assure millions of starts and stops—even under tough conditions, varying loads.

LOW MAINTENANCE

One big reason these companies chose G-E starters is low maintenance, year after year. The only tool needed is a screwdriver. Contacts are easy to inspect and remove—maybe interchanged without adding parts. Captive lockwashers, screws, and terminal clamps save time, make maintenance easier.

WIDEST VARIETY

General Electric manufactures the most complete line of motor starters. You have your choice of all NEMA sizes in general-purpose, watertight, dust-tight and explosion-proof enclosures. It's easy to add interlocks in G-E starters—change from normally-open to normally-closed—change coils.

FAST DELIVERY

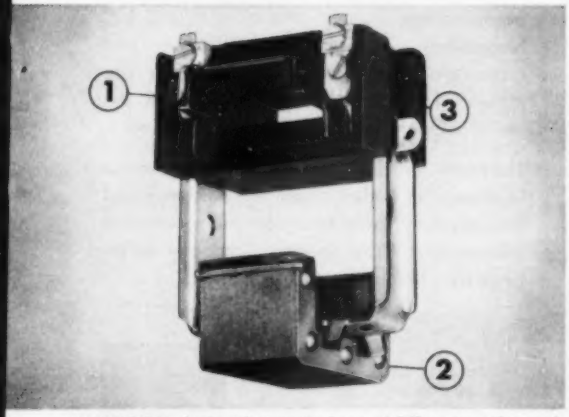
You can get G-E starters right off the shelf by contacting your nearest G-E Apparatus Sales Office or authorized distributor. For more information send for bulletin GEA-5781. Address Section 730-40, General Electric Co., Schenectady 5, N. Y.

▲ **THE ELECTRIC STORAGE BATTERY CO.** of Philadelphia, Pa. makers of Exide Batteries, chose General Electric magnetic starters to protect production flow. They report no shutdowns due to starter failure. Above, two G-E fusible combination starters are used in key section of an Exide production line.

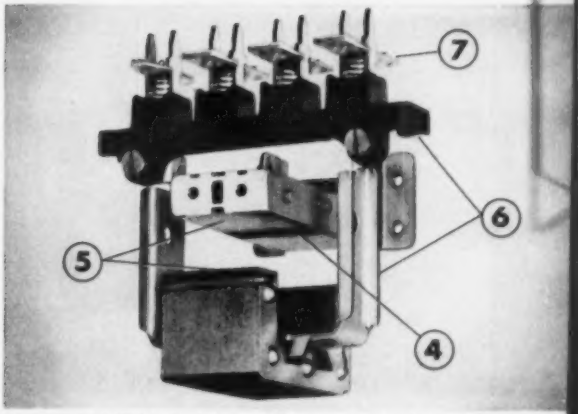
ELECTRO-LIFT, INC. of Bloomfield, N. J. makes motorized hoists which are subject to continual start-stop operation. They use G-E magnetic starters to assure unfailing operation to their customers, and to speed their own production. Ample wiring room and large pan-head screws, all in front, mean fast, easy installation.

industrial plants report:

Starters keep production up!"



LONG LIFE is built right into the heart of G-E starters: the tough G-E *strongbox* coil (1). Winding is sealed in solid, molded plastic; dust, oil, moisture sealed out. This coil cannot be damaged by a maintenance man's screwdriver. Movable magnet of silicon steel (2) moves in straight line in permanently lubricated guides (3).



DEPENDABILITY is further assured by strong, simple construction. Magnets cannot stick shut because G-E starters have a *permanent* air gap (4) in stationary magnet. Gap never wears out—it is independent of striking surfaces (5). Unit construction (6) means no bearing pins. Note block of fine silver on contact tips (7).

GENERAL ELECTRIC

CUTTING EFFICIENCY LENGTHEN TOOL LIFE

The Pratt & Whitney Cutter and Radius Grinder sharpens almost every type of cutting tool accurately and economically. You will profit immediately by improved work quality, faster stock removal, longer tool life and reduced tooling costs.

Correct angles, radii and tangents are ground on both standard and special milling cutters; end mills; thread milling cutters; lathe, shaper and planer tools; form cutters; die sinking and cherrying cutters; and Keller cutters and tracer points. Straight or tapered flutes and ordinarily difficult jobs — like swinging accurate ball and radius noses on end mills — are easily handled.

The Pratt & Whitney Cutter and Radius Grinder is ruggedly constructed of the finest materials and will retain its initial accuracy through a long life and constant hard use. Two sizes accommodate flute lengths of 4½" and 10" respectively. To assure flute uniformity and concentricity, tools are ground as they are driven — from the shank and not from the centers. Operation is fast and easy.

The P&W Cutter and Radius Grinder is a sound investment in added machining efficiency and tool economy. Send today for more complete information. Write on your Company letterhead for Circular No. S455-6.

for ALL YOUR CUTTER GRINDING AND SHARPENING

... stock or special

with the **PRATT & WHITNEY**

Cutter and Radius GRINDER

A VERSATILE TOOL SHARPENING MACHINE

GRINDS THEM ALL
- RADII, ANGLES, TANGENTS.
- STRAIGHT or TAPERED FLUTES.
- SQUARE, RADIUS and BALL ENDS.

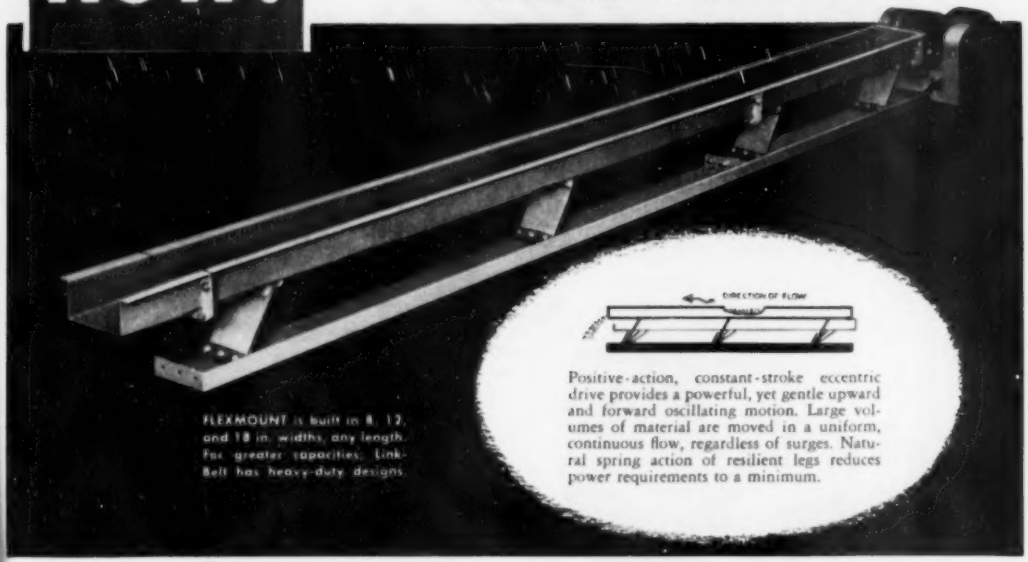
ECONOMICALLY — ACCURATELY

PRATT & WHITNEY
DIVISION NILES-BEMENT-POND COMPANY
WEST HARTFORD 1, CONNECTICUT, U. S. A.

First Choice PW *for Accuracy*

MACHINE TOOLS • CUTTING TOOLS • GAGES

NOW! FLEXMOUNT Oscillating Conveyors available from stock



FLEXMOUNT is built in 8, 12, and 18 in. widths, any length. For greater capacities, Link-Belt has heavy-duty designs.

Positive-action, constant-stroke eccentric drive provides a powerful, yet gentle upward and forward oscillating motion. Large volumes of material are moved in a uniform, continuous flow, regardless of surges. Natural spring action of resilient legs reduces power requirements to a minimum.

Stock Sections Make Flexmount Positive-Action Oscillating Conveyors—Easy to Order—Easy to Install

HERE'S a big step forward in cutting costs in handling chips, turnings, blasting shot, punchings, stampings. Link-Belt now offers you its new FLEXMOUNT design for immediate delivery from stock.

Stock sections of 8, 12, and 18 in. widths in any length, make ordering easy. Because production-line techniques are used in manufacture, easy-to-install FLEXMOUNT assures low over-all costs.

Leading manufacturers have widely adapted this latest conveying advance — both as integral equipment and as collecting conveyors for carrying material to a central disposal point. They want the uniform, continuous movement of materials . . . the long life offered by FLEXMOUNT. And they like its leakproof trough, compactness and low maintenance costs. It's a simple matter to build up any length desired in your shop from the stock length sections.

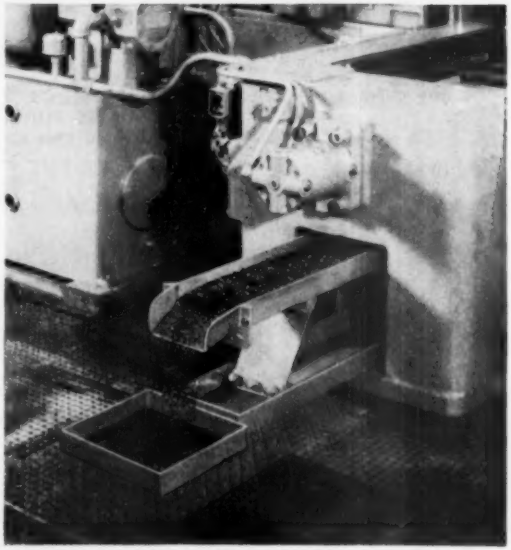
Easy-to-clean FLEXMOUNT Conveyors can be made dust-tight by the simple addition of a metal cover. For complete information, write for new Book 2478.

LINK-BELT

12,000-A

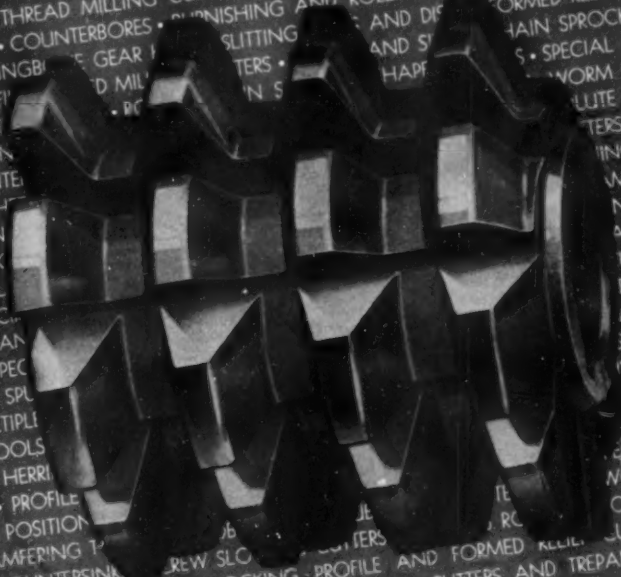
FLEXMOUNT OSCILLATING CONVEYORS

LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle, Toronto, Springs (South Africa), Sydney (Australia). Sales Offices, Factory Branch Stores and Distributors in Principal Cities.



FLEXMOUNT Oscillating Conveyor built into an automatic transfer machine. Automotive plant that bought this machine tool also uses FLEXMOUNT for its chip collection system.

FOR MORE TOUGH SPECIAL JOBS
DEPEND ON
National Tool Co.



● Years of successful experience in *special* tooling and related production problems are yours for the asking. When the job requires *special* cutting tools call in your National Tool Co. representative. He is backed by more than 46 years experience in the engineering and manufacture of *special* cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.

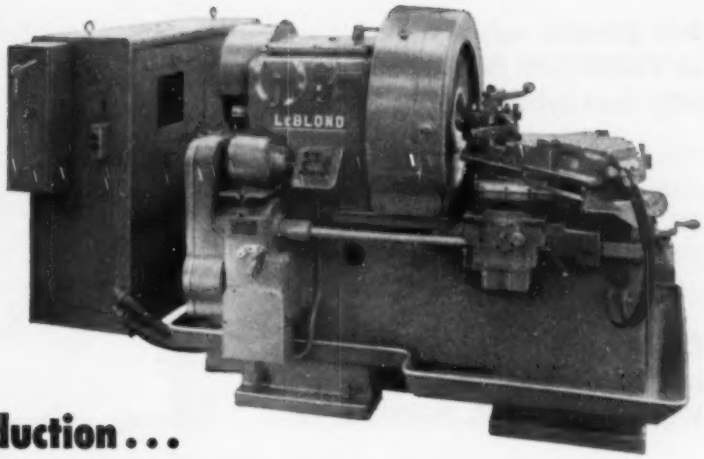
Since 1905 engineers and manufacturers of high-quality special cutting tools for the metal-working industry

National Tools Cleveland

National
TOOL CO.
Cleveland 2, Ohio

ANNOUNCING THE NEW LEBLOND

CONTOUR FACING LATHE!



Now in full production . . .

Automatically faces jet engine turbine wheel discs . . .

New design from the ground up.

High-speed automatic contour facing, semi-finish or finish.

Flexible, with ready accessibility for changeover from one disc to another.

For either steel or aluminum.

Fully automatic cycle to center *or* across center.

Automatically-controlled constant cutting speed.

Single-cylinder, adjustable-angle Hydra-Trace for simple discs.

Double-cylinder tracer for complicated discs.

Also available with power angular feed compound rest in place of hydraulic tracing unit.

For further information write . . .

THE R. K. LeBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

LeBLOND *of Cincinnati*

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 64 YEARS*

Drill grinding output tripled at THOMPSON PRODUCTS with Cawi-Spiral Grinding Method

"This inexperienced operator turns out two to three times as many precision ground drills per shift with the CAWI-SPIRAL GRINDER as a higher grade operator did with other equipment."

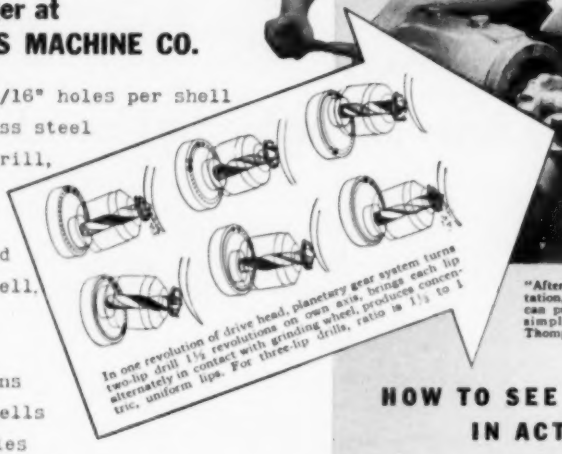
Charles Altman, General Foreman, Thompson Products, Inc., Cleveland

"After two or three days of orientation, this inexperienced operator can precision grind drills due to simplicity of machine," says Thompson Products.

Cawi-ground drills last 20 times longer at WESTERN STATES MACHINE CO.

"In drilling 1728 5/16" holes per shell in Type 304 stainless steel with a 12 spindle drill, our drills kept breaking down. 24 drills were required to complete each shell. All our drills are now ground on your Cawi Grinder and runs of ten completed shells per set, or 1440 holes per drill are now common. Our drills last 20 times as long."

R. Zihlman, Western States Machine Co., Hamilton, Ohio



In one revolution of drive head, planetary gear system turns two-lip drill 1½ revolutions on own axis, brings each lip alternately in contact with grinding wheel, produces concentric, uniform lips. For three-lip drills, ratio is 1⅓ to 1

TAKE THIS PRODUCTION TIP FROM OTHER CAWI USERS...

The Cawi's revolutionary grinding principle reduces downtime to replace drills, cuts regrinding costs to a fraction compared to other methods. Even third-grade operators quickly turn out accurate, concentric grinds because the *skill is built into the machine.*

HOW TO SEE THE CAWI IN ACTION

Just say the word—and a Cawi engineer will drive a demonstration trailer right to your plant and put it to work regrinding your drills—tool steel, high-speed or carbide—from 1/16" to 1". Try the drills in actual production—note how long they last, how their closer tolerances often eliminate the need for reaming, how they permit faster drilling speeds.

Or if you prefer, drop in at the nearest Orban Service Center.

Delivery from stock. Engineered servicing and stock parts within 48 hours from Orban Service Centers in Newark, Detroit, Cleveland.

KURT ORBAN

COMPANY, INC.

205 East 42nd St., New York 17 • 4220 Prospect Ave., Cleveland 13 • 19450 James Couzens Highway, Detroit 35
8735 Melrose Ave., Los Angeles 46 • **Canadian sales by European Machinery Ltd., 11 King St. West, Toronto, Canada**

9 design problems that can be met with the... Allenut

Ever-increasing applications for the new ALLENUT have caused sales to double within the past two years. Here are some of the things it can do to aid your product designing:

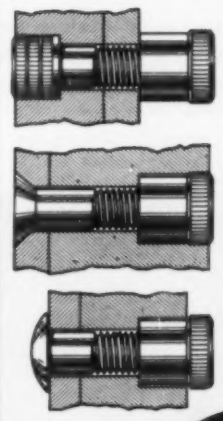
1. Self-anchoring in any metal. Allenut provides positive anchoring action through its hardened knurls.

2. Compact design. Requires no space for box wrenching. 12-point socket permits tightening in awkward places.

3. Smooth surfaces. Fits flush or below surface in counterbored hole . . . permits streamlined, safe surfaces.

4. A ready-made, hardened, tapped hole. When used as a bushing, prevents costly stripping of threads caused by frequent removal and replacement of screw or bolt. In castings and other soft metals a stripped hole can be counterbored, an Allenut inserted and the same bolt or screw used.

5. Tighter fit. Greater thread contact than with ordinary nuts because of Class 3 fit. Weld-like setups accomplished with one hand wrenching. Allenut holds firm against turn of screw.



6. Usable with any type of bolt or screw. Permits space-saving, internal wrenching of cap screws, T bolts, machine bolts, and other common fasteners.

7. Saves parts. No washers required when anchored.

8. Easier to use. Knurled ring facilitates fingering-in. Allenut is always square to counterbored hole. Removable by hitting screw or bolt head with tap of a hammer.

9. Reusable indefinitely. Anchoring action remains unimpaired. Hardened threads and socket stand up under repeated removal and replacement.

Allenuts are available in a full range of 14 standard sizes from no. 4 to 1" from leading industrial distributors.

We welcome your inquiry and request for engineering details on Allenut applications.

THERE'S A Barber-Colman HOB

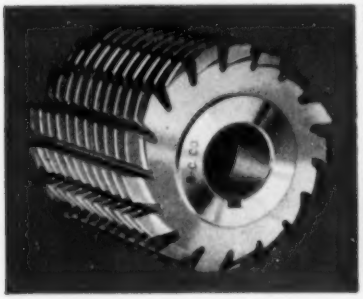
Choose from unground, ground, ultra-precision, multithread, carbide-tipped, roughing, pre-finishing or finishing hobs — made with standard or special tooth form, straight or taper bore — in a complete range of sizes and pitches. You'll find one that's designed particularly to produce your special requirements.

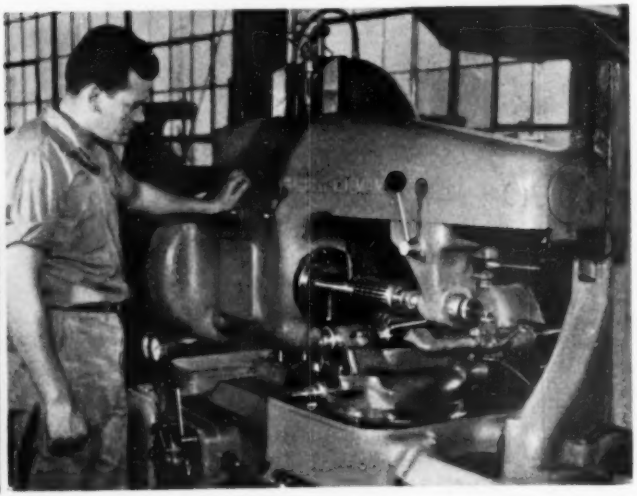
Because of more than forty years of gear cutting experience, Barber-Colman engineers can recommend tools which will best fit your requirements. They can supply gear hobs in any of the standard classes of tolerances, plus an ultra-precision class. These hobs range all the way from small 268 DP hobs to those for the largest hobbing machines, as coarse as 1 DP. With improved methods and equipment used in their manufacture, these hobs produce gear tolerances exceptional within their respective classes.

If your plant is cutting gears, you will find this Barber-Colman service the easiest, most direct and efficient approach to control of your gear quality problems. Write today for recommendations on your jobs.

Multithreads

Barber-Colman unground multithread hobs are producing good results on this semi-finishing job. Stock left for shaving is .0020" to .0025", which is normal for clean-up in shaving. Cut is 8", cutting time 10 minutes, and feed used, .100" per work revolution.





DESIGNERS OF STANDARD AND SPECIAL

FOR EVERY ONE OF YOUR GEAR REQUIREMENTS

CLASS C ACCURATE UNGROUND

To provide the lowest tool cost per gear, Barber-Colman offers Class C Accurate Unground hobs with either standard or special tooth forms. Many users have found these hobs sufficiently accurate for pre-shaved gears, reducing tool cost considerably. Gears finished with Accurate Unground hobs are not as consistently accurate or smooth running as those finished with ground hobs. However, where these elements are not too critical, the unground form may be used for finishing. Class C Accurate Unground hobs are also available for finish hobbing of parallel-key and involute spline shafts.

Ask one of our field engineers to call, or send us blueprints showing the tolerance required. Our experienced engineering staff will recommend the most efficient hob for your job, considering accuracy, tool cost and production according to your specifications.

Carbide Tipped

Barber-Colman Carbide Tipped Hobs are designed especially for long tool life and high production requirements on non-ferrous materials.

Ground Classes

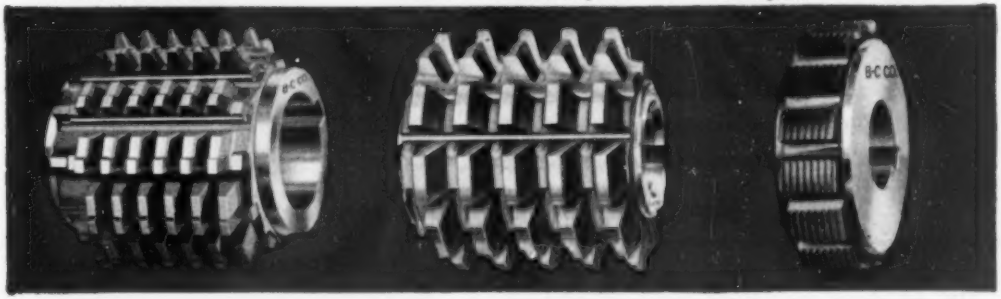
Ultra-Precision Ground
Class A Precision Ground
Class B Commercial Ground

Unground Classes

Class C Accurate Unground
Class D Commercial Unground

Fine Pitches

Barber-Colman Hobs are exceptionally accurate and are considered the best hobs available in the fine pitch class for instrument, fuse, meter and watch gears.



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HOBBING MACHINES
HOB SHARPENING MACHINES

BARBER COLMAN

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METAL CUTTING TOOLS SINCE 1908

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- No jigs needed!
- Automatically positions to ±.0001"!
- Production boosted as much as 250%!
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Sensitive and Upright Drills
Jig Borers
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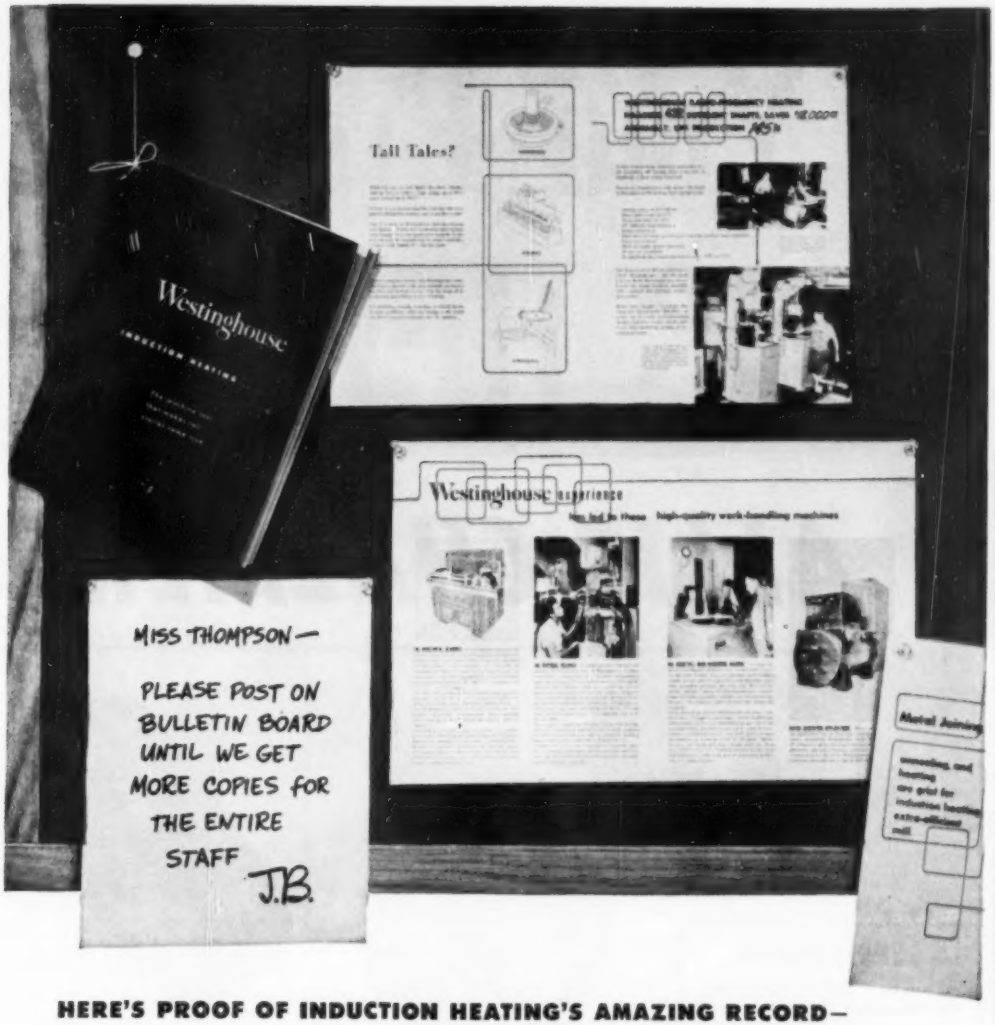
Sensitive Radial Drills



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Actual case histories of hardening, brazing, soldering, and annealing installations show how the RF process has meant increased production (as high as 2000%), lower costs (as much as 90%), and a higher quality product for many of America's leading manufacturers. It's an amazing story — with facts and figures released by the companies themselves — and results that speak for themselves. See how these manufacturers' experiences may parallel your own . . . how RF Heating may help achieve production efficiency in *your* plant.

Send for this free booklet today — ask for B-4782. Write Westinghouse Electric Corporation, Department M-35 2519 Wilkens Avenue, Baltimore 3, Maryland.

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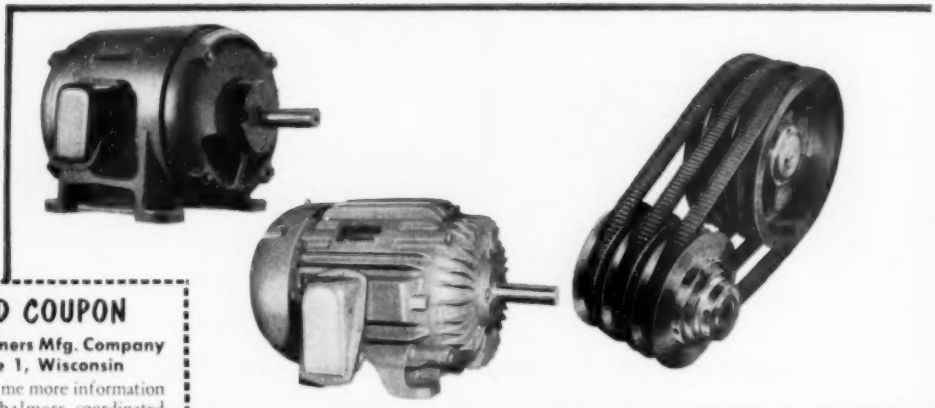
INDUCTION HEATING

If Your Problem IS HERE—

ALLIS-CHALMERS



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Allis-Chalmers Mfg. Company
Milwaukee 1, Wisconsin

Please send me more information on Allis-Chalmers coordinated equipment.

- ☐ **Motors — Bulletin 52B6052**
- ☐ **Control — Bulletin 14B7132**
- ☐ ***Texrope* V-belt Drives — Bulletin 20B6051**

Name

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Company

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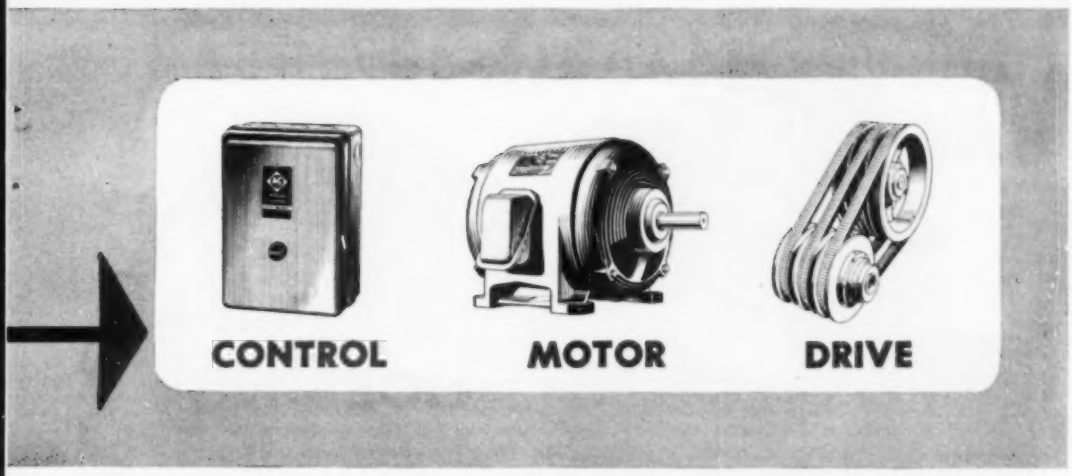
MOTORS — From ½ hp up. Types include single and multi-speed squirrel-cage, dc, wound-rotor and synchronous. Enclosures include drip-proof, splash-proof, totally-enclosed, non-ventilated, totally-enclosed fan-cooled and explosion-proof. Totally-enclosed and explosion-proof motors built in famous finned design which greatly reduces cleaning problems and costs, or in the tube-cooled design which gives the same maintenance savings in the larger sizes.

Designs for specialized purposes include gearmotors, vertical hollow shaft motors and textile motors. In addition to this wide variety of standard motors, Allis-Chalmers will design and manufacture a special motor for almost any purpose.

***TEXROPE* DRIVES** — The original multiple V-belt drive and still the most complete line of V-belt drive products in the industry. Belts include famous *Super-7* V-belts, high capacity belts with 40% more pulling power than standard belts, oil-resisting belts, static-conducting belts and special belts for wide range variable speed drives. All standard *Texrope* belts except the smallest are made with the exclusive grommet design.

Constant speed sheaves include *Texsteel* sheaves and *Magic-Grip* easy mounting sheaves in a complete range of sizes. Variable speed sheaves include *Vari-Pitch* sheaves for stationary and motion control and the *Vari-Pitch* automatic sheave. For extremely wide speed ranges, the *Vari-Pitch* speed changer is available.



CAN HELP YOU

From Power Line to Driven Shaft

YOU CAN SAVE TIME, SAVE WORK, be sure of your power train design when you use coordinated components from Allis-Chalmers. For Allis-Chalmers can supply you with control, motor and *Texrope* V-belt drive for your machine . . . all of integrated design and manufacture.

UNIT RESPONSIBILITY

By using Allis-Chalmers coordinated drive components, you save paperwork and the time required to match parts from different sources. More important, you know that the components will fit together properly. And you don't have to worry about passing the buck on service. Allis-Chalmers stands behind the complete drive.

ENGINEERING HELP

Every Allis-Chalmers representative is an experienced engineer who can give you the kind of help you need in selecting the best drive for your machine. And this team of field experts is backed by a large factory engineering staff.

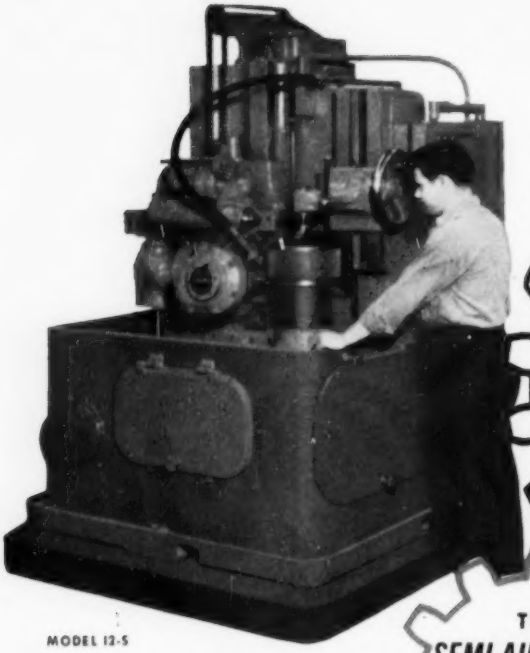
CERTIFIED SERVICE

Allis-Chalmers continues to serve you after the sale with 97 Certified Service Shops located in every industrial area in the country. Certified Service Shops are carefully selected independent shops that use only factory approved parts and methods in servicing Allis-Chalmers equipment.

CONTROL — There is an Allis-Chalmers control to meet every requirement of motor operation through the complete range of motor sizes. Manual and magnetic, reversing and non-reversing, across-the-line and reduced voltage starters are included. Push button and pilot devices are available in any number of positions and in all combinations. Accessory control equipment includes dc contactors, timing relays, contactors for heavy duty starting and rotary control switches.

Texrope, Texsteel, Magic Grip, Vari-Pitch, and Super-7 are Allis-Chalmers trademarks.

ALLIS-CHALMERS



MODEL 12-S

Semi-
Automatic
HOBBING
does the JOB
FASTER, BETTER, MORE ACCURATELY

THE
SEMI-AUTOMATIC
LEES-BRADNER GEAR HOBBING MACHINE

FEATURES AND SPECIFICATIONS

L-B patented Hob in-out mechanism

L-B electric hob shifter now available on the LEES-BRADNER Model 12-S

Rated capacity in steel . . . . . 4 DP

Maximum diameter capacity,
a) With 4" hob . . . . . 12"
b) With 3" hob . . . . . 13"
Travel (Max. face width) . . 16"

The pioneers of gear hobbing machines in this country have done it again!

Now Lees-Bradner brings you the ingenious Model 12-S *semi-automatic* gear hobbing machine with the electric hob shifter.

This amazing machine produces gears of maximum accuracy—including right or left hand spur and helical gears up to 45°.

After loading, it is necessary only to press the starter button and the hob is fed automatically across the face of the work at constant speed. At the completion of the cut the machine stops for reloading. Hence, one unskilled operator can easily handle a battery of these machines.

If production time and accuracy are at a premium in your plant it will pay you dividends to talk to your Lees-Bradner representative—*soon*.

the **LEES-BRADNER** *Company*

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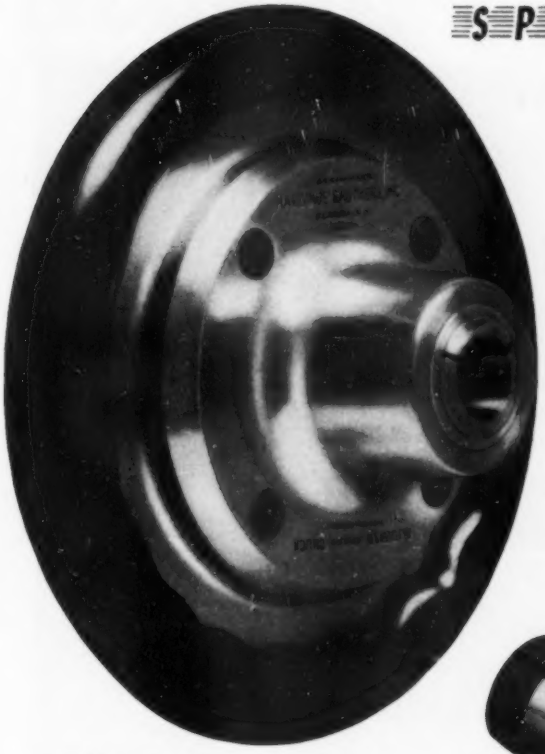
ELMIRA, N.Y.

SPEED

Collet Chucks with HARDINGE STEEL COLLETS



Available in Five Sizes:
1", 1⅜", 1¾", 2¼", and 3½" collet capacity.

for Accuracy and Durability at Low Cost

When you order Hardinge-Sjogren Chucks and Hardinge **Steel** Collets you get all these advantages:

1. Complete Capacity for Hexagon and Square as well as Round.
2. Lowest Initial Cost.
3. Longest Service Life.
4. Grips both **short** and long lengths properly.

. . . . . and HARDINGE tempered steel collets assure you of quick release, sustained accuracy and durability.

Write for Bulletin 8— complete information on

HARDINGE-SJOGREN Chucks and Collets.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

General Purpose

Only **CARBO** TRADE

"Carborundum" and "Aloxite" are registered trademarks which indicate manufacture by The Carborundum Company, Niagara Falls, New York

Wheels . . .

General Purpose Wheels by CARBORUNDUM give you the widest possible range of abrasive tool versatility. Furnished in standard sizes for every known make of grinding machine, they improve the quality and quantity of work from veteran and inexperienced operators alike. In the cool cutting, long lasting V30 bond developed especially for general purpose work, "ALOXITE" aluminum oxide wheels are outstanding performers. They give you the ideal combination of abrasive grain, bond, grade and structure which provide highest grinding performance at lowest total cost.

ORDER FROM YOUR CARBORUNDUM DISTRIBUTOR TODAY. He's your best bet for complete stocks, prompt delivery, experienced counsel on latest developments in the field. You'll find him listed in the yellow pages under "Abrasives." Phone him today—it's to your profit!

This "tell-all" booklet is FREE!

THE CARBORUNDUM COMPANY, Dept. AM 81-81
Niagara Falls, New York

Please send me, FREE, your booklet, "Causes and Correction of Common Grinding Errors."

NAME AND TITLE

COMPANY

STREET AND NUMBER

CITY ZONE STATE

RUNDUM

MARK

offers ALL abrasive products...to give you the proper ONE

81-81

Gates V-Belts are chosen to keep HELICOPTERS aloft!

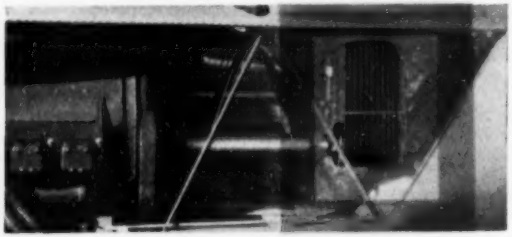
McCulloch Tandem-Rotor Helicopter

(Above) Two-place helicopter employs tandem-mounted, intermeshing rotors—a total of six rotor blades—powered by a 200-hp, six-cyl., aircooled horizontal engine installed at the rear. (Lower left) Gates-engineered V-BELTS, shown to rear of the engine, transmit power from the engine to the main drive shaft which in turn drives the reduction gearing for the rotors.

Because a helicopter is air-borne entirely by the turning of its rotors, McCulloch Engineers who designed this helicopter and supply it to the Navy had to be sure that the drive to the rotors was, above all, safe and reliable—a drive that would not fail when the helicopter was in the air.

The special difficulty in designing this drive was the extreme *compactness* required.

On small diameter pulleys and short center distances, the drive must handle 200 horsepower for 1000 hours at cruising speed and 500 hours at high speed. Ordinarily, it would have been impossible to achieve these results.



A Notable Application of Gates SPECIALIZED Research

However, Gates had developed a V-Belt which in thousands of applications had proved to have the exact characteristics required for this helicopter drive—and Gates had also developed design data which showed at once the applicability of this belt.

It was not by accident, therefore, that Gates Engineers were at once prepared to supply a V-Belt capable of handling this most exacting assignment and —in close co-operation with McCulloch Engineers—they developed the drive shown which has most successfully met all requirements.

Gates readiness to meet successfully *any* V-Belt Drive assignment is possible because Gates runs an *average* of 32,000 hours of testing *every week* on V-Belts alone! (32,000 hours is equivalent to *five years* of life for one belt.)

And the real value to you of such exhaustive testing is this: Laboratory findings are carefully checked by tests made under actual field conditions and the *results* are at once reduced to *usable data* for the design of V-Belt Drives to *perform whatever task may be required!*

Phone for a Gates Field Engineer

If you have a difficult drive to design, or if some drive in your plant is giving trouble, or if you only want to be sure what size and construction of V-Belts will give the most efficient and the lowest cost service on any particular drive—you have only to phone a Gates Field Engineer, *always near you* in all industrial centers.

Just look in your phone book under "Gates Rubber." A Gates Field Engineer will come right to your plant and put at your service the full benefits of Gates V-Belt knowledge and experience *without the slightest obligation!*

ENG-522

Gates VULCO ROPE DRIVES

Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS of the U. S. and 71 Foreign Countries

THE GATES RUBBER COMPANY

DENVER, U. S. A.

The World's Largest Makers of V-Belts

Only Lucas CAN MAKE A LUCAS

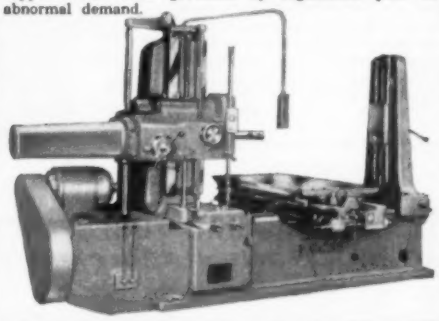
. . . but others are lending a hand

This is one of America's outstanding plants of its kind, and every tool in it is there for the production of Lucas Horizontal Boring, Drilling and Milling machines. This specialization means a greater output of critically needed machines for the defense program.

Thousands of man hours of exclusive experience on Lucas mills enable us to keep quality abreast of quantity.

Many an outside supplier is working 'round the clock on component parts to supplement our own efforts. Final assembly and inspection is still carried on in our own plant.

We still have to keep many a loyal customer waiting, because our output like that of all other defense machine suppliers has been governed by regulations plus an abnormal demand.



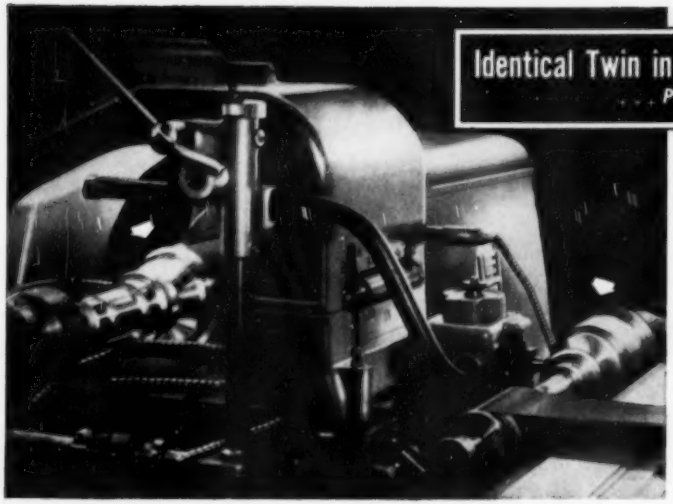
Your inquiry and your order are still as welcome as ever. When you do get the Lucas you need you'll find it your No. 1 money maker – the most used machine in the shop.

THE NEW BRITAIN LUCAS MACHINE COMPANY

LUCAS

Precision

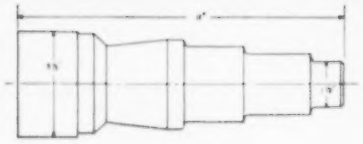
HORIZONTAL BORING, DRILLING AND MILLING MACHINES
LUCAS MACHINE DIVISION, THE NEW BRITAIN MACHINE CO.
CLEVELAND 8, OHIO

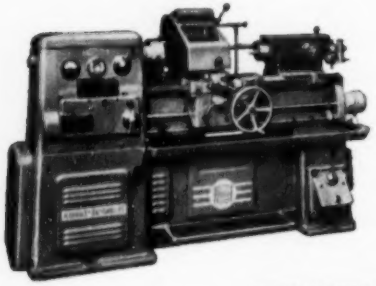


Identical Twin in Less than Four Minutes

. . . Produced on the

HIGH SPEED HYDRAULIC COPYING LATHE





Examine this miracle of modern engineering made possible by the H.E.B. High Speed Hydraulic Copying Lathe. Pictured at the right is the turned master; at the left you see its identical twin — a shaft of S.A.E. 4130 steel accurately copied in just 3¾ minutes. That's breath-taking speed for such precision finish.

The H.E.B.'s patented tracer device is built into this ruggedly constructed lathe. There are no troublesome attachments, and *setting time takes no more than 10 to 20 minutes.* Experience on production lines proves time and again that finished parts are copy-turned up to 300% faster than on multi-tool lathes!

With its 20 H.P. motor the **OP Model** takes heavy cuts with carbide tools at spindle speeds 50 to 3600 RPM. **GT Models** with rotating pattern are designed for copying an infinite variety of irregular, non-circular work.

More than 1000 of these modern copying lathes are now in use worldwide . . . designed and built in France by H. Ernault Batignolles, manufacturers of machine tools for almost a hundred years.

Catalogs on both of these machines, including complete specifications, are available upon request. Write or telephone now for catalog or demonstration.

TYPE 178 CONSTAN CARBIDE TOOL GRINDER

The Constan Grinder is specially designed for sharpening carbide tools, etc., without attachments . . . lengthens their life and improves cutting capacity. Heavily built, the Constan combines smooth operation and ease of setting with great rigidity. The inclinable table incorporates a ball and socket vise so that the tool may be clamped in any position. Two diamond wheels — one for roughing and one for finishing — are mounted on the wheel head, and each may easily be brought into position. The machine may also be used for sharpening milling cutters.

H·E·B

"THE WAY TO TURN"

IMMEDIATE DELIVERY

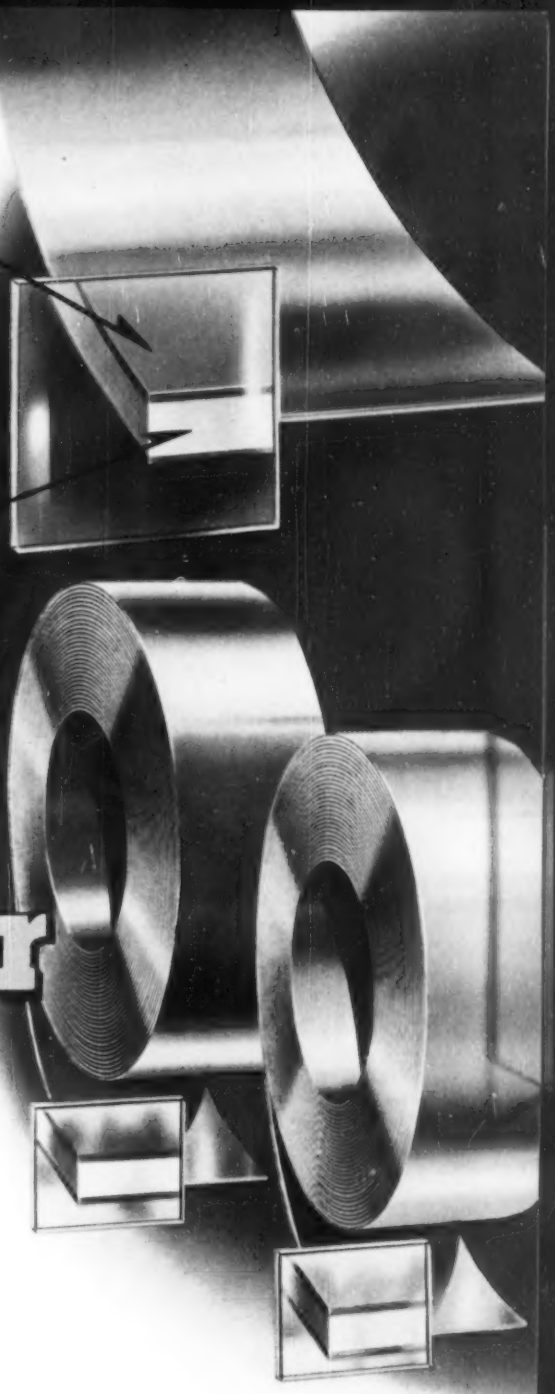
H. E. B. MACHINE TOOLS, INC.

475 FIFTH AVENUE, NEW YORK 17, N. Y.

Telephone: LExington 2-0266

COPYING LATHES • ENGINE LATHES WITH COPYING ATTACHMENTS • TOOL ROOM LATHES • CARBIDE TOOL GRINDERS

All copper (or brass) where you need it- -and steel where steel serves best



SuVeneer®

CLAD METALS

SuVeneer Clad Metals give you *surfaces* of genuine solid copper or brass, to do the jobs for which you ordinarily specify these materials . . . with the big new plus of *steel* for greater strength, twice the elasticity, and lighter weight, than either copper or brass used alone. • You save critical metals for defense—you benefit your products' performance—when you specify time-proved **SuVeneer** Clad Metals. *Let us work with you!*

Superior Steel
CORPORATION
CARNEGIE, PENNSYLVANIA

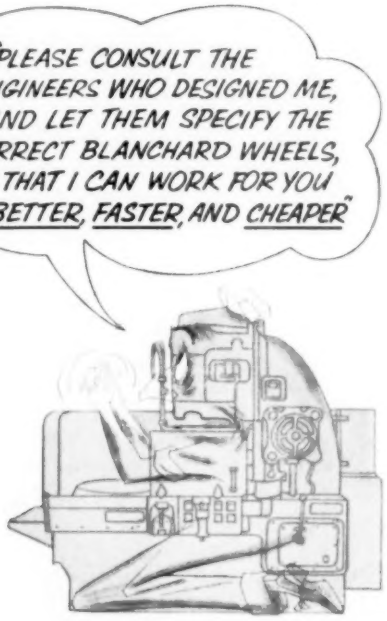
UNCLE!

Are your machines begging for mercy because of misuse?

Blanchard Grinders, *with proper grinding wheels, can* and *do* give high production with extremely close tolerances for dimension and flatness. However, a No. 11 Blanchard user recently received erroneous advice on abrasive wheels from an outside source. The result was that 35 high-speed cam plates were ground on both sides in 1¼ hours with surface finish of 24 micro-inches.

By referring the problem to Blanchard, it was easily demonstrated that the No. 11, with correct grinding wheel, would give desired results—90 to 100 cam plates per hour, with surface finish of 4 micro-inches, dimension tolerance of ±.0002, and flat within 2 light bands.

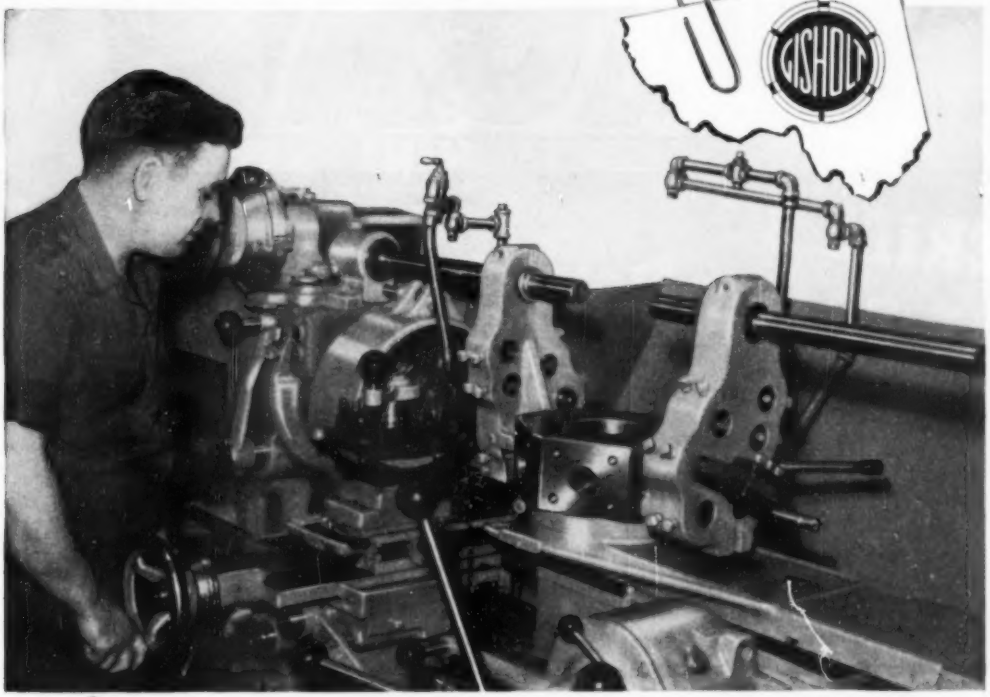
Blanchard wheels are best for Blanchard Grinders — let Blanchard give you the benefit of their vast experience so that you too can get the most from your Blanchard machines.

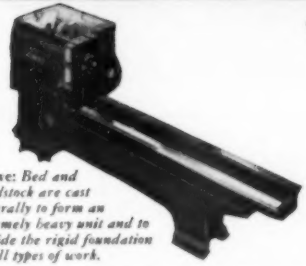

"PLEASE CONSULT THE ENGINEERS WHO DESIGNED ME, AND LET THEM SPECIFY THE CORRECT BLANCHARD WHEELS, SO THAT I CAN WORK FOR YOU BETTER, FASTER, AND CHEAPER"

Information on correct surface grinding procedure and wheel selection are given in "Work Done on the Blanchard" and "The Art of Surface Grinding." Write for free copies today!

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY 64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.





Above: *Bed and Headstock are cast integrally to form an extremely heavy unit and to provide the rigid foundation for all types of work.*

Below: *Block type ways are straddle keyed to the bed and ground in perfect alignment with the spindle. All working surfaces are hardened to 64-66 Rockwell "C".*

ACCURACY THAT DOESN'T "WEAR OFF"

Here are two good reasons why you can count on the accuracy of Gisholt Turret Lathes—now and years from now.

One-piece bed and headstock, cast as a heavy, rigid unit, reduce distortion and vibration to a minimum. Headstock is jig-bored to insure—and maintain—perfect alignment of spindle and drive shafts, with ample metal to provide the most solid support possible.

Hardened steel ways are augmented by hardened steel strips secured to the ram saddle, as well as hardened steel gibs and clamps, making an assembly that is virtually wear-proof. Its accuracy is further preserved by force lubrication.

These advantages are yours for the long life of any Gisholt Turret Lathe. Ask for complete details.

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

TURRET LATHES · AUTOMATIC LATHES · SUPERFINISHERS · BALANCERS · SPECIAL MACHINES

NIAGARA

SERIES B
GAP FRAME Double Crank Presses

Niagara B-4 x 72 Press at the General Machine Works in Los Angeles. It is shown here fitted with two dies for forming operations on an automatic deflector.

The same press as shown above arranged with dies for redrawing projectile parts in 5 steps. Shells are transferred manually from die to die.

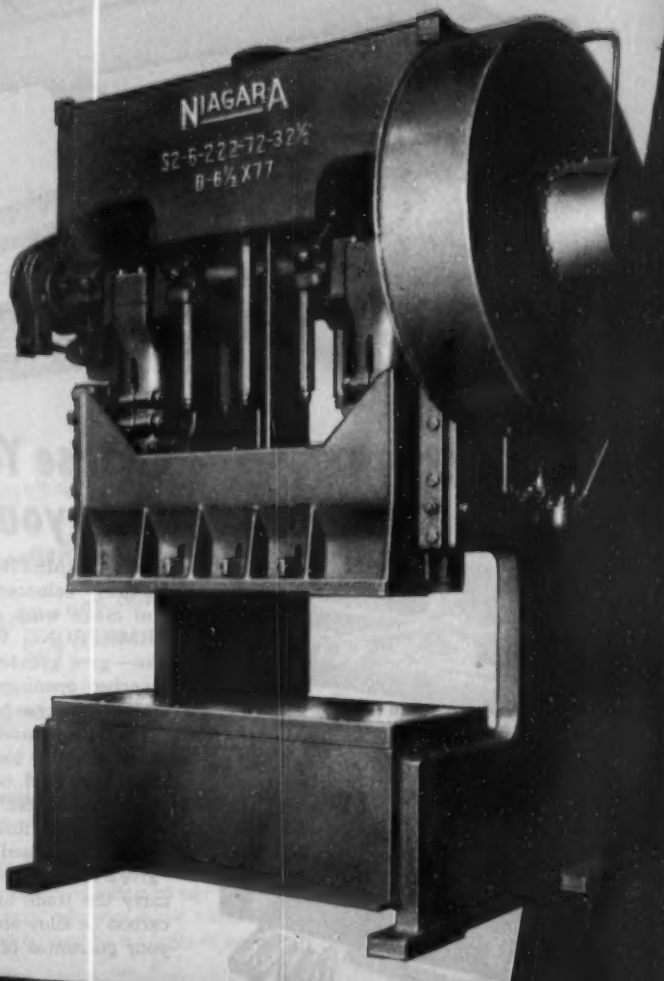
NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

Manufacturers of a complete line of sheet metal working equipment ranging from small hand tools up to large power operated machinery.

Versatility and High Production

- Gap frame convenience with double crank width.
- Ideal for long progressive dies or multi-station dies.
- Rear of press open for full accessibility.
- One piece welded steel frame for maximum rigidity and long die life.
- Exclusive Niagara Sleeve Clutches for maximum productive strokes per minute and minimum maintenance cost.
- Niagara cushions for drawing operations.
- Automatic feeds for high production jobs.

Write for Bulletin

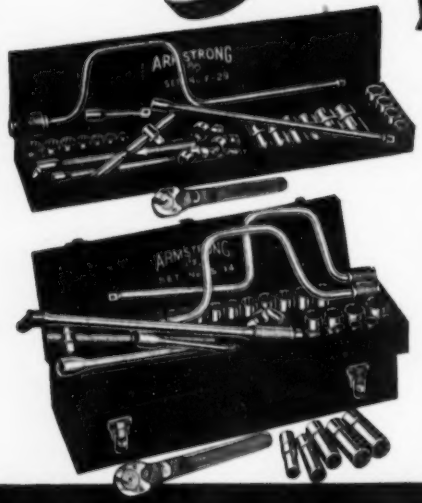


Niagara B-6½ x 77 Gap Frame Double Crank Press. Air actuated, electrically controlled sleeve clutch with friction clutch convenience and sleeve clutch economy. Air releasing brake. Clutch and gearing operating in a bath of oil. Air counterbalance for slide with surge tank over-size cylinder and pressure regulating valve to compensate for various weights of dies. Cross bar knockout in slide. V-belt motor drive.

DISTRICT OFFICES: NEW YORK • CLEVELAND • DETROIT • PHILADELPHIA

ARMSTRONG WRENCHES

Choose Your Wrenches as you do your friends--for life

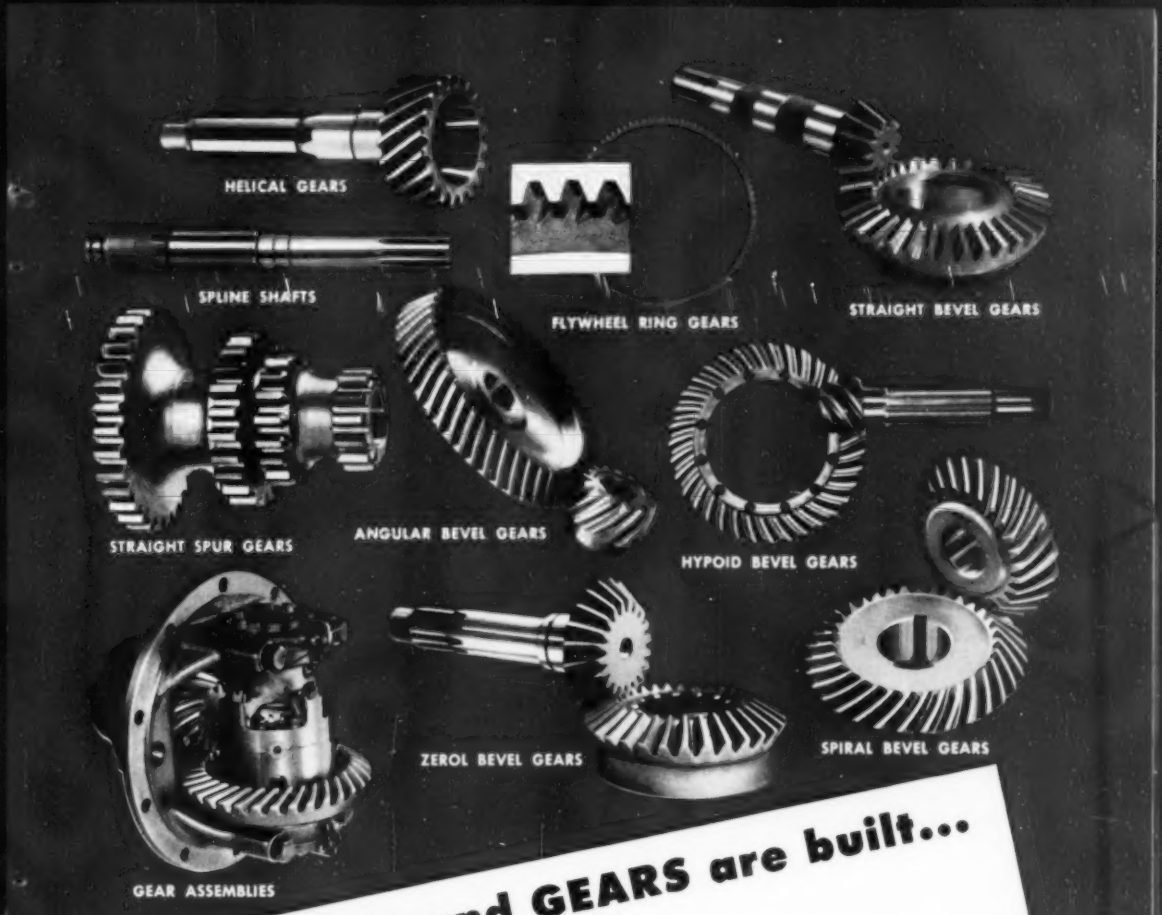


Specify ARMSTRONG Wrenches for lifetime service, for finely balanced tools that feel right in the hand and make work easier, faster and less fatiguing. ARMSTRONG Wrenches generally are longer for size—give greater leverage. Accurately milled or broached openings give the proper clearance. They are safe wrenches because they are strong beyond need.

Drop forged and machined from high tensile carbon or special alloy tool steels, ARMSTRONG Wrenches are heat treated, tempered and tested to an exact balance of toughness, hardness and tensile strength. Each is beautiful in finish and line, is a quality tool to be proudly possessed by any mechanic—or certain to "give a lift" to any assembly line. Buy wrenches which carry the trade marks HI-TEN or ARMALOY. On carbon or alloy steel wrenches these trade marks are your guarantee of lifetime quality.

WRITE FOR CATALOG

ARMSTRONG BROS. TOOL CO. *"The Tool Holder People"*
5215 W. ARMSTRONG AVENUE CHICAGO 30, ILL.



Double Diamond GEARS are built...

. . . to produce low installed cost

. . . to serve economically and dependably on the job for which you buy them

. . . and to do credit to your product and your reputation

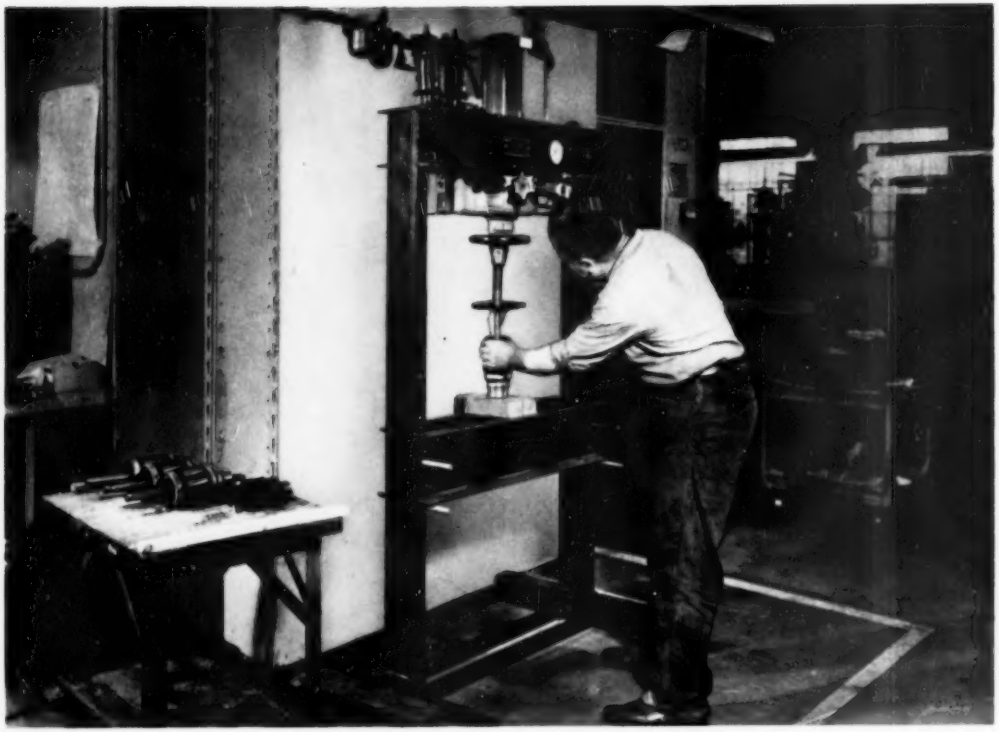
The above quotation appears in the introduction of our new 40-page reference book which fully describes the ten types of gears in which we specialize. If you are interested in gears built to those standards have your secretary write for a copy of the complete catalog.

DOUBLE DIAMOND TRADE MARK GEARS

AUTOMOTIVE GEAR WORKS

RICHMOND, INDIANA

FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS



Motor Manufacturer Saves 15% on Labor Costs with Air-Powered DAKE Hydraulic Press

Here is another example of the way Dake Presses bring substantial production economies.

An electric motor manufacturer has a variety of forcing, forming, bending, and straightening jobs in his plant. These are a few of them:

Pressing fans on armature shafts (see photo above)

Pressing slip rings on armature shafts

Pressing commutators on armature cores

Pressing laminations to thickness for stator frames

Pressing arches in stator frame coils

Until recently these jobs were handled in a variety of ways—mostly on a hand press. Since installing the Dake Air-Hydraulic Press he finds there is a saving of about 15% on labor costs. He also reports that the press affords a quicker, easier way to do many jobs that formerly were handled on other equipment.

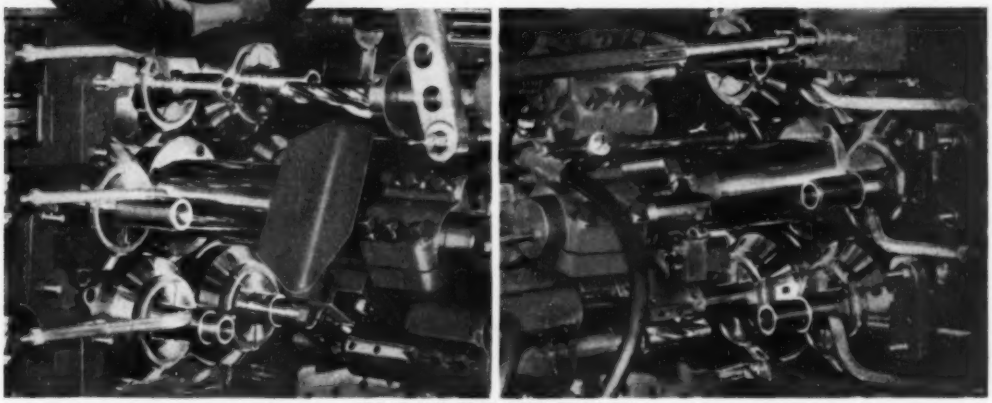
Dake Hydraulic Presses are available in hand, air, and electrically powered models with capacities from 25 to 300 tons. See your nearest Dake Industrial Distributor.

Write for this Catalog

Dake Engine Company, 602 Seventh St., Grand Haven, Mich.

DAKE PRESSES

NO NEED TO "SETTLE" FOR LESS



FRONT AND REAR SIDES OF 2¾-SIX

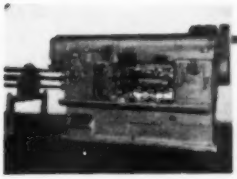
Multiple Spindle Bar Automatics produce more work per square foot of floor space than do other types of metal cutting machine tools. But, when *one* spindle is "down" *all* are "down." It's why dependability will always be the outstanding requirement of the "Automatic."

So many factors are involved in dependability that any weakness in design, engineering, material, or construction, will eventually contribute to higher costs of operation and maintenance.

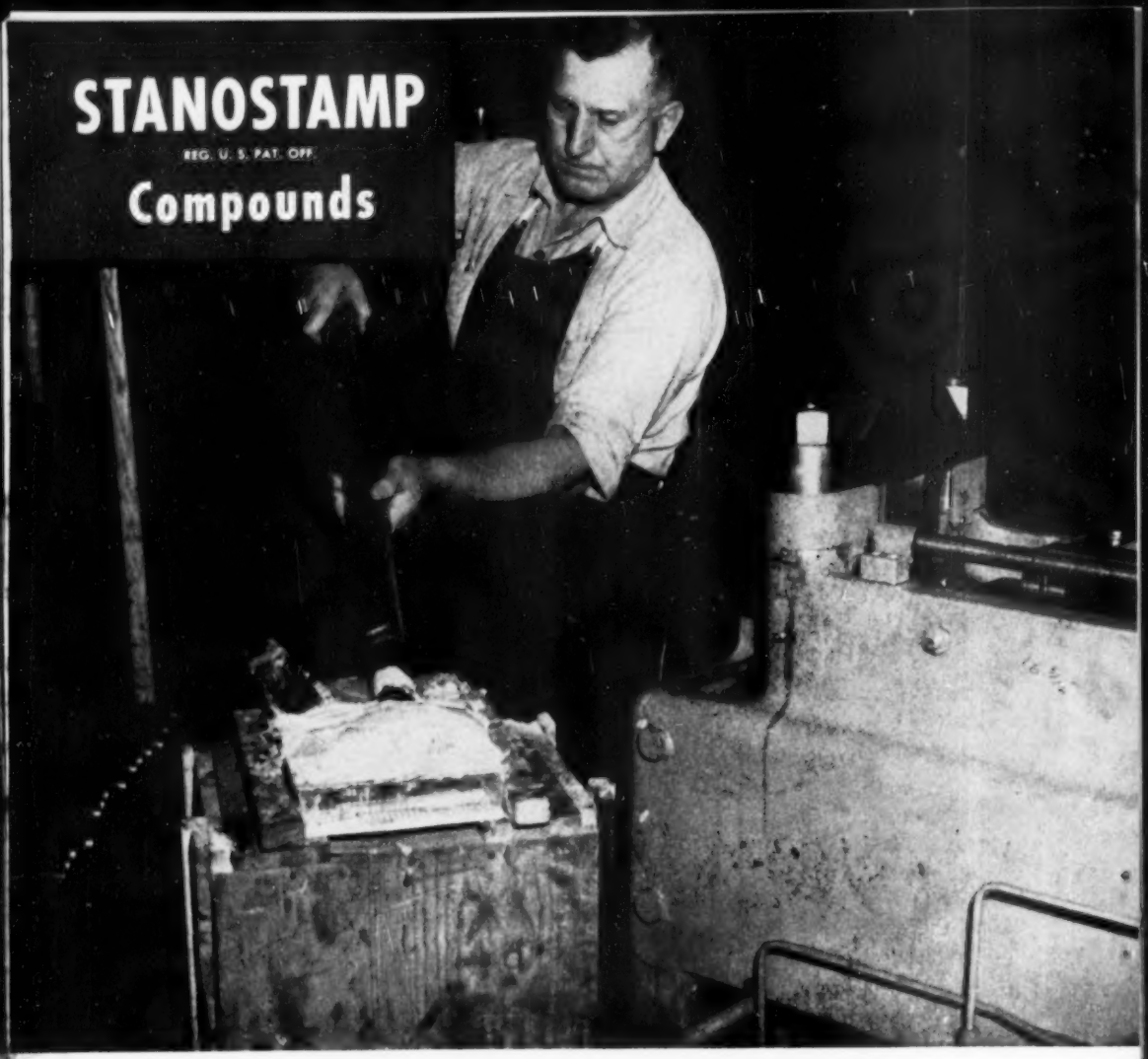
Part of any new machine's service to the prospective user is the availability of *full* information. No prospective purchaser need "settle" for less. At least it's that way with CONOMATICS.

In producing the piece shown, on a 2¾-SIX, the eccentric forming attachment (see upper right illustration) combines the well known CONOMATIC facilities of form tool support and "all position" attachment spindle drive.

A Comparison of ALL Automatics is in favor of Cone



Conomatic } CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.



Easy on the draw

● Shown above is the drawing operation used by The Lock Joint Tube Co. in the production of automobile steering gear jackets. Two ¼-inch draws are made on steel tubing.

Dissatisfied with the performance of a conventional drawing compound on this job, operators took the advice of a Standard Oil lubrication specialist and switched to STANOSTAMP C Compound.

This product has met their needs on every count. It has proved economical to use because operators have been able to mix it with water and soluble oil and apply that mixture in light coatings to the steel tubing. STANOSTAMP C has provided better protection for dies, thus reducing wear. Draws are now made on over 2,000 pieces before dies require polishing. Although the drawn pieces are not cleaned until long after the drawing operation, there have been no rusting troubles.

Whatever your problem or need, you'll find, as did this midwest company, that a Standard Oil lubrication specialist can help you. He has a complete line of high quality cutting oils to offer and the training and practical experience to apply them most effectively. You can get his help quickly and easily by phoning your local Standard Oil Company (Indiana) office. Or write: Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Ill.

What's YOUR problem?

Russ Jenkins (left), lubrication specialist in Standard Oil's South Bend office, helped the superintendent of this midwest plant improve a drawing operation through the use of a STANOSTAMP Compound.

Mr. Jenkins is one of a corps of able lubrication specialists who are located in Standard offices throughout the Midwest. These men have been specially trained in Standard Oil Lubrication Engineering Schools and, in addition, have a wealth of on-the-job experience. The specialist nearest your plant is ready to give prompt, expert, and thorough attention to your lubrication problems.

It's easy to obtain his services. A phone call to your nearest Standard Oil Company office will bring him quickly to your plant . . . with no obligation to you, of course.

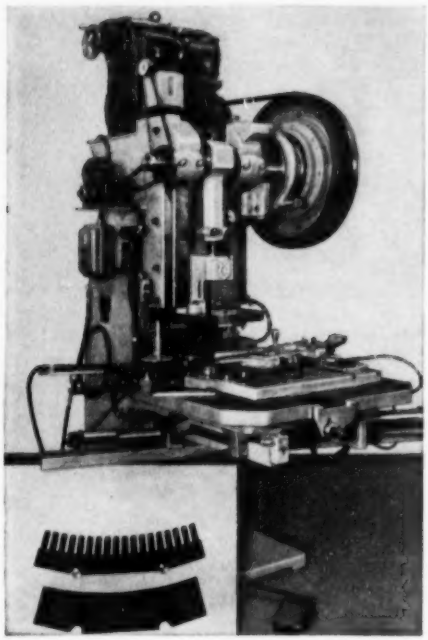
Spells "finish" for another cutting problem. A midwest manufacturer wanted better finish on steel valve seats. STANICUT Cutting Oil 117 BCS replaced a more expensive product on this screw machine job and produced the desired finish. It also extended tool life, resulting in lower tool cost and fewer tool changes.

Solution for a hard water problem. SUPERLA Soluble Oil has helped the U. S. Machine Corporation, Lebanon, Indiana, overcome a hard water problem. Mixed with the hard water used in the plant, SUPERLA Soluble Oil has given excellent results on jobs calling for the machining of cast iron. There has been no spoilage of the work due to rusting. Tool life has been highly satisfactory. Clean operation and freedom from odor development have provided desirable working conditions for machine operators.

STANDARD

STANDARD OIL COMPANY
(INDIANA)

New V & O Notching

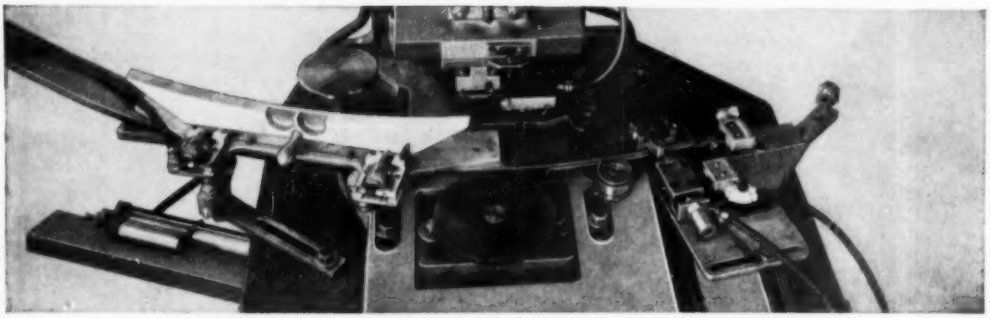


These new V & O machines consist of (1) a segmental notching press of advanced design and (2) a high speed notching press featuring a roller gear drive for more accurate indexing.

Both developments provide improvements that assure greater precision in spacing than has been available heretofore. This improved accuracy at the press cuts production costs and helps speed motor assembly. Slot alignment in stacked laminations is uniformly even, minimizing filing and drifting as operations and production expenses.

NEW V&O SEGMENTAL NOTCHER

Self-Indexing (No index segment).
Produces rotors or stators.
Semi-automatic — operator merely loads and unloads.
Slot spacing adjustable without tooling change.
Variable speed drive — control press speed to suit job.
Punch half slots or half poles without change in tooling.
Reduced set-up time.
Vernier adjustment for slot spacing.



Lamination blank is carried on an adaptor plate mounted on a master segment. Air cylinder moves the blank in circular path past the die.

OTHER EMHART PRODUCTS INCLUDE:

HIGH SPEED AUTOMATIC PRESSES
HENRY & WRIGHT
Division of Emhart Mfg. Co.
HARTFORD 1, CONNECTICUT

GLASS MAKING MACHINES
HARTFORD-EMPIRE CO.
Division of Emhart Mfg. Co.
HARTFORD 2, CONNECTICUT

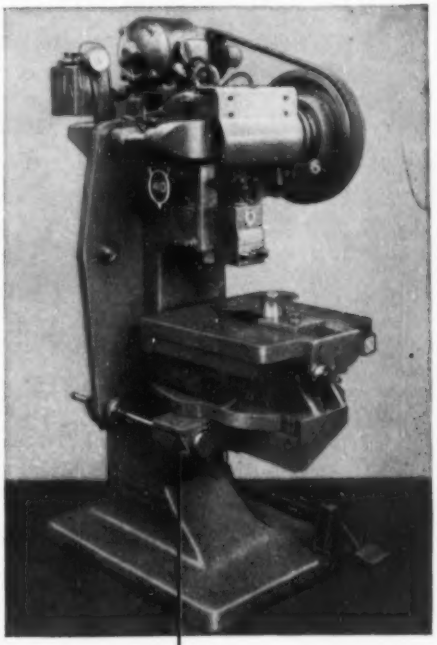
AUTOMATIC PACKAGING EQUIPMENT
STANDARD-KNAPP
Division of Emhart Mfg. Co.
PORTLAND, CONNECTICUT

PLASTIC BOTTLES, BOOS, TUBES, SPECIAL SHAPES
PLAX CORPORATION
Subsidiary of Emhart Mfg. Co.
HARTFORD 1, CONNECTICUT

Presses *assure uniform, accurate spacing... slots always line up...filing minimized*

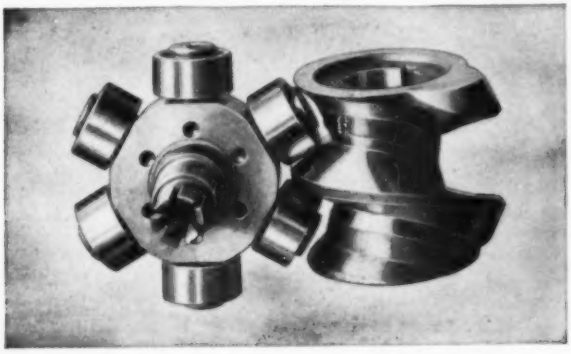
Other advantages of the new notchers are that they are easy to adjust for any notch combination, even prime numbers; require less downtime for changes and thus afford higher productivity over a given period of operation.

You know how much it costs now to produce and assemble laminations. These new notchers will help you realize substantial savings at the press and in subsequent production operations. Find out for yourself by getting the complete facts from V & O.



ROLLER GEAR NOTCHER

Unusually low maintenance — reduced hazards to dies.
Higher degree of precision.
Wider range of notch combinations with fewer set-up parts.
Precise, positive indexing.
Low inertia indexing — 50% lower than standard.
More production per machine.



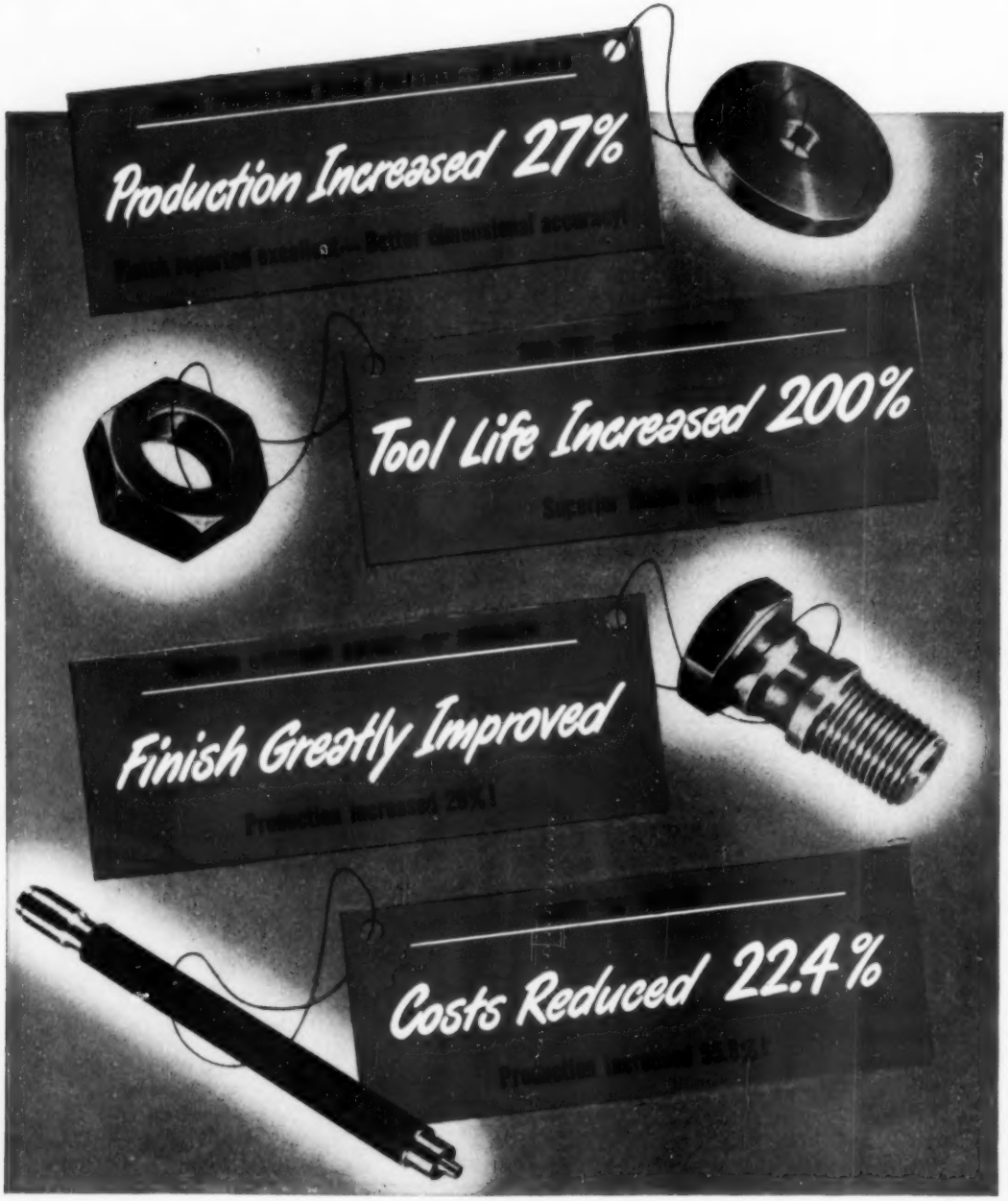
Roller gear, showing spider and cam. Preload of bearings on cam results in positive dwell while punching.

Only the best is good enough

DESCRIPTIVE CATALOGS **Catalogs containing complete specifications and operating details on V & O Precision Power Presses and Feeds are available. Please write The V & O Press Company, 301 Union Turnpike, Hudson, N. Y.**

THE V & O PRESS COMPANY
Division of Emhart Mfg. Co.
BUILDERS OF PRECISION POWER PRESSES AND FEEDS SINCE 1889
HUDSON NEW YORK

You can **look ahead** with confidence



to bigger output, lower costs

...when you do the job with MX

today's faster-cutting screw stock!

THIS is no news to the hundreds of shops that have switched from ordinary Bessemer screw stock to U·S·S Free-Machining MX. It may be news to you.

During the past few years, results obtained in producing over a billion screw machine parts of many different kinds have established these facts; 1) wherever you put fast-cutting MX to work, production goes up and costs come down; 2) you can safely figure that MX will cut the cost of *any* part you now machine from ordinary Bessemer screw stock; 3) the more machine work your parts require the greater your savings will be.

Can you afford to ignore these well-proved benefits?

If you haven't tried MX on a production basis, now is a good time to start. Prove on your own machines that despite its slightly higher cost, MX is actually the most economical bar stock yet developed.

The reason is simple. U·S·S Free-Machining MX cuts cost in four ways. By increasing the rate of production, *it lowers the cost per part.* By prolonging tool life, *it reduces downtime.* By assuring better part finish it often *eliminates extra finishing operations.* By providing closer dimensional accuracy, *rejections are minimized.*

U·S·S Free-Machining MX is being produced in all the popular bar sections and sizes. You can obtain it in cold-finished form from your regular supplier as "MX" or under his own identifying trade name. In hot-rolled form, MX is available direct through our nearest district sales office.

For more parts and better parts—at lower cost per part—standardize on MX.

UNITED STATES STEEL COMPANY, PITTSBURGH
AMERICAN STEEL & WIRE DIVISION, CLEVELAND · COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

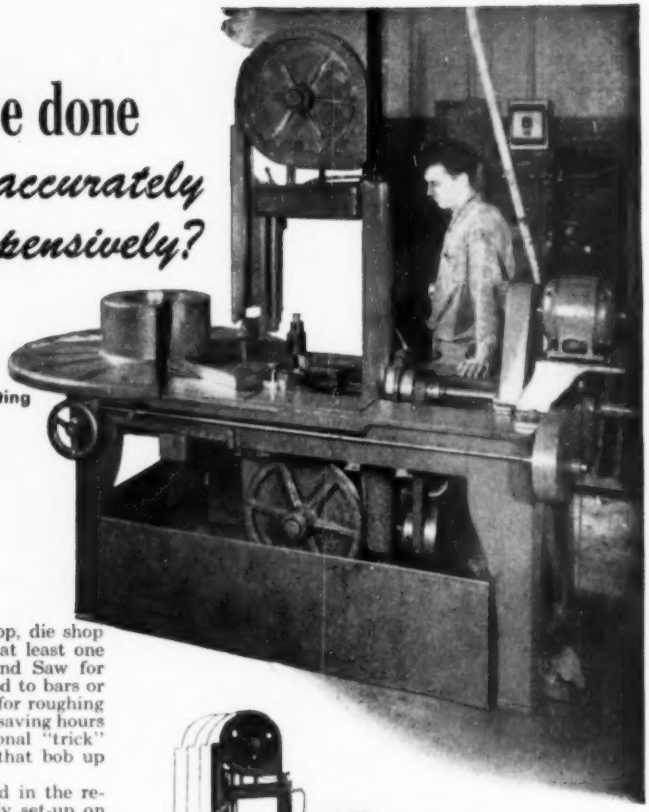
USS

3-1952

UNITED STATES STEEL

How else could this job be done

so easily, so accurately and so inexpensively?

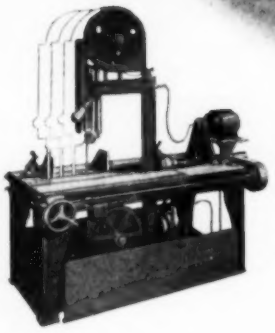


Segmentation of 42" Steel Casting

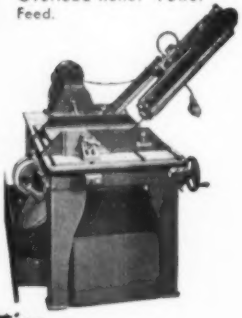
Every tool room, machine shop, die shop and maintenance department needs at least one No. 8 MARVEL Metal-cutting Band Saw for cutting off anything from ¼" drill rod to bars or billets of 18" x 18" cross-section . . . for roughing large work to size and shape, thereby saving hours of machining . . . for those occasional "trick" jobs, impossible on any other saw, that bob up in every plant.

Odd shapes that can't be held in the removable, quick-action vise, are easily set-up on the No. 8's large, T-slotted work table. MARVEL Overload-Relief Power Feed insures accurate cuts under the most adverse conditions because blade pressures are automatically held within limits which are pre-set instantly for each job. The blade is never forced beyond its capacity to efficiently and accurately remove metal . . .

Close limits are further assured through the work being clamped rigidly to the bed of the saw and the blade power-fed through it instead of pushing the work through the blade. This is also true in miter cutting, as the blade column—*not the work*—is swung to the required angle. The handiest, most versatile machine tool, it is also the busiest in most shops.



This double exposure illustrates how the blade maintains its vertical position while moving into and through the work, impelled by the automatic MARVEL Overload-Relief Power Feed.



Column set at angle to cut 45° miter on 18" beam. Entire saw column can be swung to cut at any angle from vertical to 45° right or 45° left.

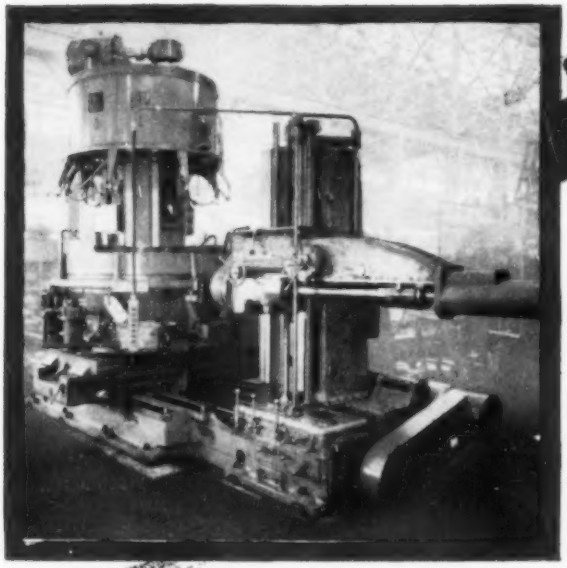
MARVEL *Metal Cutting* **SAWS**

Better Machines–Better Blades

Write for Catalog

ARMSTRONG-BLUM MANUFACTURING CO.

5700 Bloomingdale Avenue — "The Hack Saw People" — Chicago 39, U. S. A.



No Trick . . . Actual Test

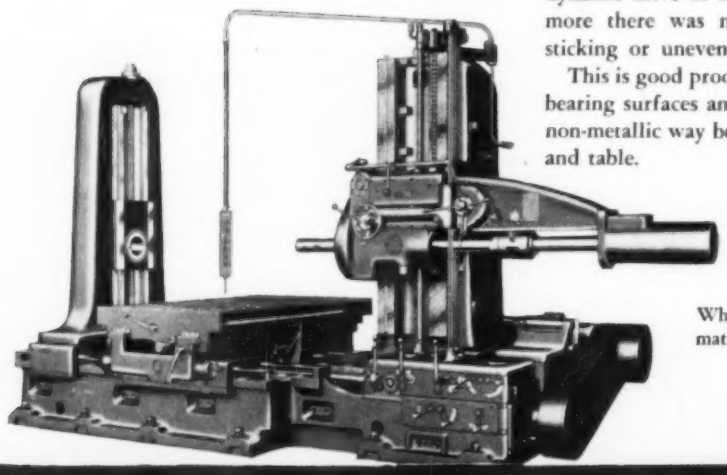
37,000 lb. LOAD . . .

To test the load distribution and ease of action of the table and saddle on the BULLARD new 4-WAY BED HORIZONTAL BORING MACHINE, this test was actually made by placing a Type "D" MULT-AU-MATIC on the table.

This load was placed as illustrated. Hand cranking was used on both table and saddle and both were moved with comparative ease considering the 18½ ton load.

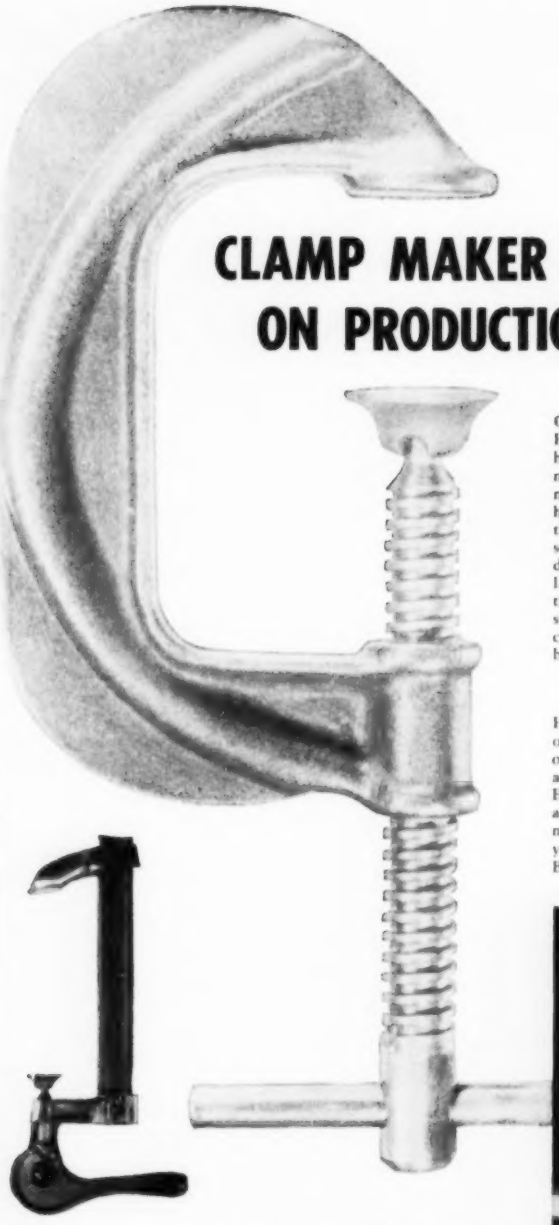
Fine power feed and rapid traverse were then applied and movements made in all directions with extreme smoothness and no overloading of the hydrodynamic drive or drive motor. Furthermore there was no tendency toward sticking or uneven motion.

This is good proof of well distributed bearing surfaces and the smoothness of non-metallic way bearings of the saddle and table.



When writing for information refer to BU 206.

THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT



CLAMP MAKER PUTS THE SQUEEZE ON PRODUCTION BOTTLENECKS!

BATAVIA CLAMP CO., makers of eccentric and C-clamps, bought a 50 ton motor driven KRW Hydraulic Press to do one job — set rivets in the heads of eccentric clamps. Then, like hundreds of manufacturers, they found they had gotten much more than they bargained for. They had been having trouble with loosening of T-handles on their C-clamps. Their new KRW Press offered this solution: Drill the pin hole 1/64" undersize and drive the pin in place with the Press. It worked like a charm. Straightening C-clamps that bent as they cooled, resizing distorted plungers and straightening distorted cams and feet on eccentric clamps — these are just a few of the production bottlenecks remedied by their KRW Hydraulic Press.

YOU'D be surprised how many ways a KRW Hydraulic Press can save you money on your operations. Available in 25 to 150 ton capacities, one, two or three cylinder models, KRW Hydraulics are the most versatile presses on the market. Easily converted in minutes from one set-up to another. Self-contained above ground, they come in motor, air or hand operated types. Check with your machinery dealer or get in touch with us in Buffalo. Write, wire or phone Dept. 11.

K · R · WILSON

215 MAIN STREET BUFFALO 3, N.Y.

Smith & Mills PATENTED SOLID RAM

..to "rough" with ease

..to finish with precision

..to speed your production

..to please your operators

This exclusive Smith & Mills Solid Ram is only one of the recent progressive engineering developments which have made both management and operators prefer Smith & Mills Shapers . . . **just as they have for 64 years.**

See our Catalog in Machine Tool Catalogs

The Smith & Mills COMPANY
affiliated with Bryant Machinery & Engineering Company
General Office: 400 West Madison Street, Chicago 6
EXCLUSIVE REPRESENTATIVES THROUGHOUT THE WORLD

Fine Shapers since 1888

If you work with Stainless Steels

be sure you are acquainted with the and fabricating characteristics of grades

• Spot welding Type 430 20-gage sheets in fabrication of a Thurmaduke food warmer by Duke Manufacturing Company, St. Louis, Mo.

USS

U·S·S STAINLESS STEEL

SHEETS · STRIP · PLATES · BARS · BILLETS
PIPE · TUBES · WIRE · SPECIAL SECTIONS

physical properties available to you

SUCCESSFUL FABRICATION of Stainless Steels calls for a thorough knowledge of the physical properties and fabricating characteristics of each grade that is available to you. Since these properties and characteristics differ from those of plain carbon steel, modified working procedures are often required.

The complete line of U·S·S Stainless Steels covers a wide range of chemical compositions. However, these grades fall into two general classifications—the nickel-bearing Stainless Steels and the straight-chromium grades.

At the present time, nickel-bearing grades are restricted in their use by government order. For certain essential applications you are permitted to use these nickel-bearing grades, but for the most part you will be working with straight-chromium Stainless Steels.

If your experience has been concentrated on the nickel-bearing grades, it is essential that you know the respects in which straight-chromium Stainless Steels differ. Fabricators who have used these straight-chromium grades as alternates to nickel-bearing Stainless Steels report no difficulty in handling them when proper methods are used.

No matter what grades of Stainless Steel you are called on to fabricate, detailed knowledge of the physical properties and fabricating characteristics is a must for satisfactory performance and economical handling.

• Welding Type 430 Stainless Steel — a straight-chromium grade — during fabrication of a three-compartment, coved-corner sink by Century Equipment Co., Chicago, Ill. Type 308 welding rod is used, thus tending to eliminate brittleness in welded areas.

This book will give you the facts

You'll find a wealth of information on all grades of U·S·S Stainless Steel in our book "Fabrication of U·S·S Stainless and Heat Resisting Steels." It contains recommendations on such fabricating procedures as welding, riveting, soldering, joint design, machining, cutting, forming, annealing and finishing. It gives you data on typical properties of all grades — both nickel-bearing and straight-chromium. If you'd like a copy, mail the coupon below.

In addition, our representatives will be glad to assist you in selecting steels and fabricating methods where unusual conditions must be met. Feel free to ask for this help.

United States Steel Company
Room 2806-Q, 525 William Penn Place,
Pittsburgh 30, Pa.

Please send me a copy of "Fabrication of U·S·S Stainless and Heat Resisting Steels."

Name .....

Title .....

Address .....

City ..... **State** .....

UNITED STATES STEEL COMPANY, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

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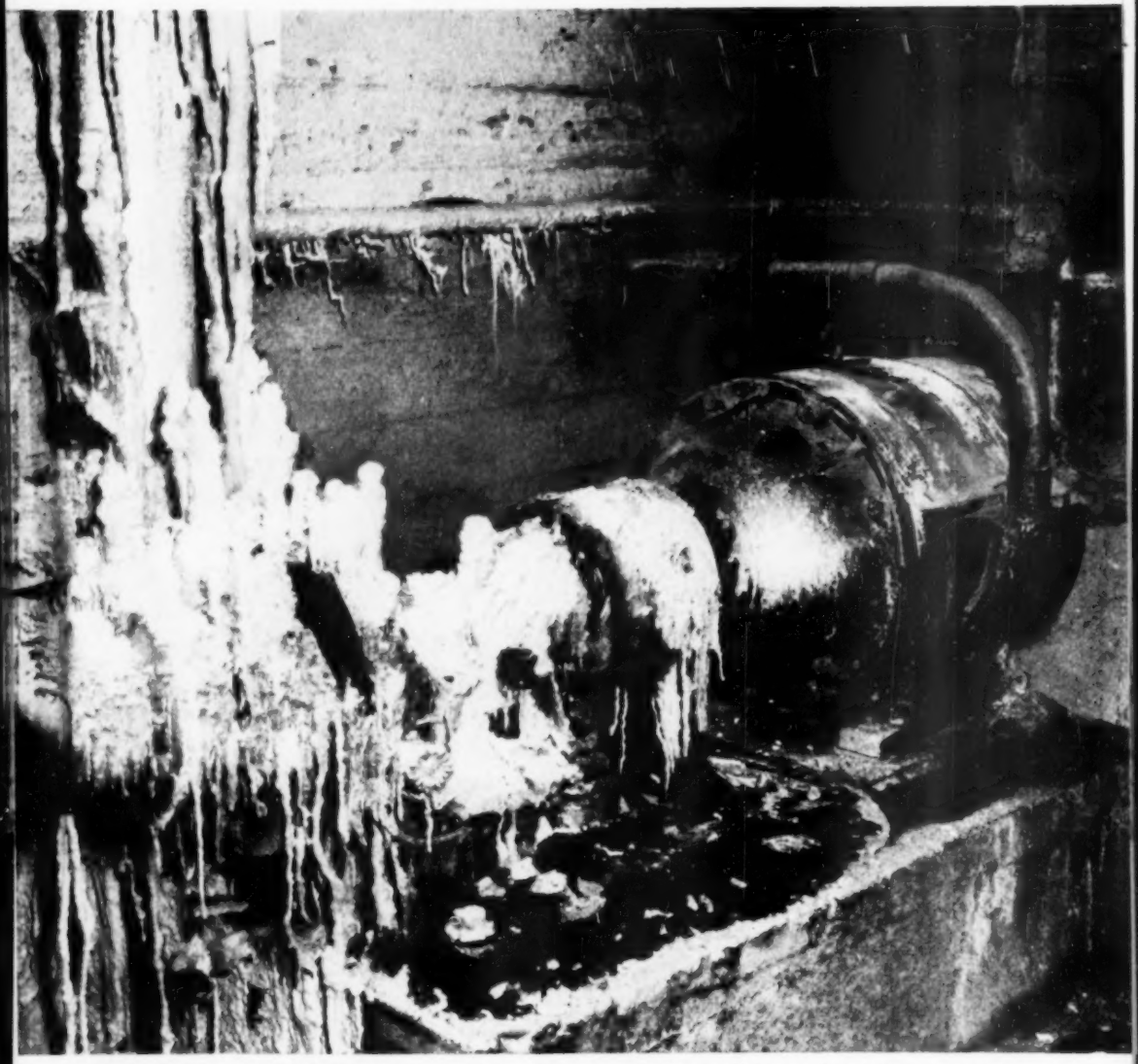
UNITED STATES STEEL

WHEN JOBS ARE TOUGH



CORROSIVE ATMOSPHERE doesn't bother this standard, "off-the-shelf" Tri-Clad motor. Totally enclosed, fan cooled, it runs 12 hours a day, six days a week, driving a flash cooler pump under tough conditions in a chemical plant.

GENERAL ELECTRIC

INDUSTRY DEPENDS ON G-E TRI-CLAD MOTORS

REG. U.S. PAT. OFF.

Here are three typical tough jobs being done safely, economically, and without interruption, by G-E Tri-Clad motors. They help show why more than 10,000,000 horsepower of G-E Tri-Clad motors are serving American industry today.

WIDEST VARIETY

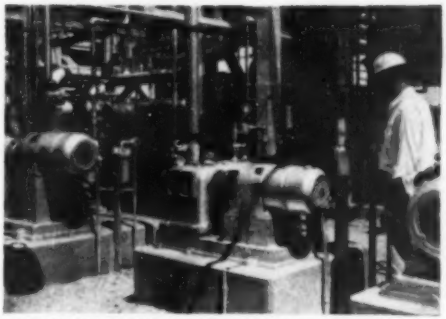
With the widest selection of standard motors obtainable anywhere, the Tri-Clad motor line offers ratings up to 2000 hp; all types of enclosures; gear motors, brake motors, and adjustable-speed drives—plus many other mechanical and electrical modifications to meet your requirements.

TRIPLE PROTECTION

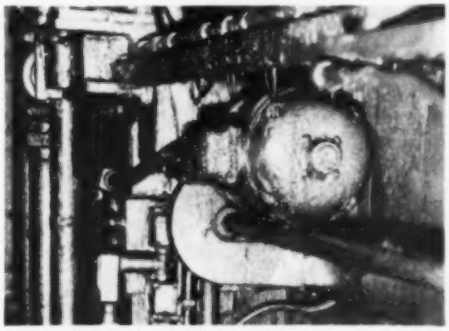
You get triple protection with *every* Tri-Clad motor—against physical damage, electrical breakdown, and operating wear and tear. Completely enclosed bearings last longer because they can be relubricated if necessary—and *without shutdown!* For specific product information, use the coupon below, or contact your nearby G-E Apparatus Sales Office, authorized G-E Agent or Distributor.

IMMEDIATE DELIVERY

Most standard G-E Tri-Clad motors are available immediately from stock. And the most complete sales and service network in the motor industry assures you prompt service by trained specialist and application engineers, for all your motor problems. General Electric Co., Schenectady 5, New York. 752-16



EXPLOSIVE ATMOSPHERE dangers are avoided by using standard explosion-proof Tri-Clad motors, such as these gear-motors driving water and hydrocarbon pumps in an oil refinery.



OIL, MOISTURE, ABRASIVE DUST can't stop this totally-enclosed Tri-Clad motor, operating below the strip in a cold strip steel mill. Motor is completely protected inside and out.

PROGRESSIVE MECHANIZATION . . .

a new G-E MORE POWER TO AMERICA program—motion picture and manual—case histories of the latest mechanization trends.

Send for literature.

Section D752-16
General Electric Co., Schenectady 5, N. Y.

Please send me the following on Progressive Mechanization:

☐ Free copy of the Progressive Mechanization Manual (GEA-5789)

Please send the following product bulletins:

☐ GEA-3580 (Open Dripproof Motors)

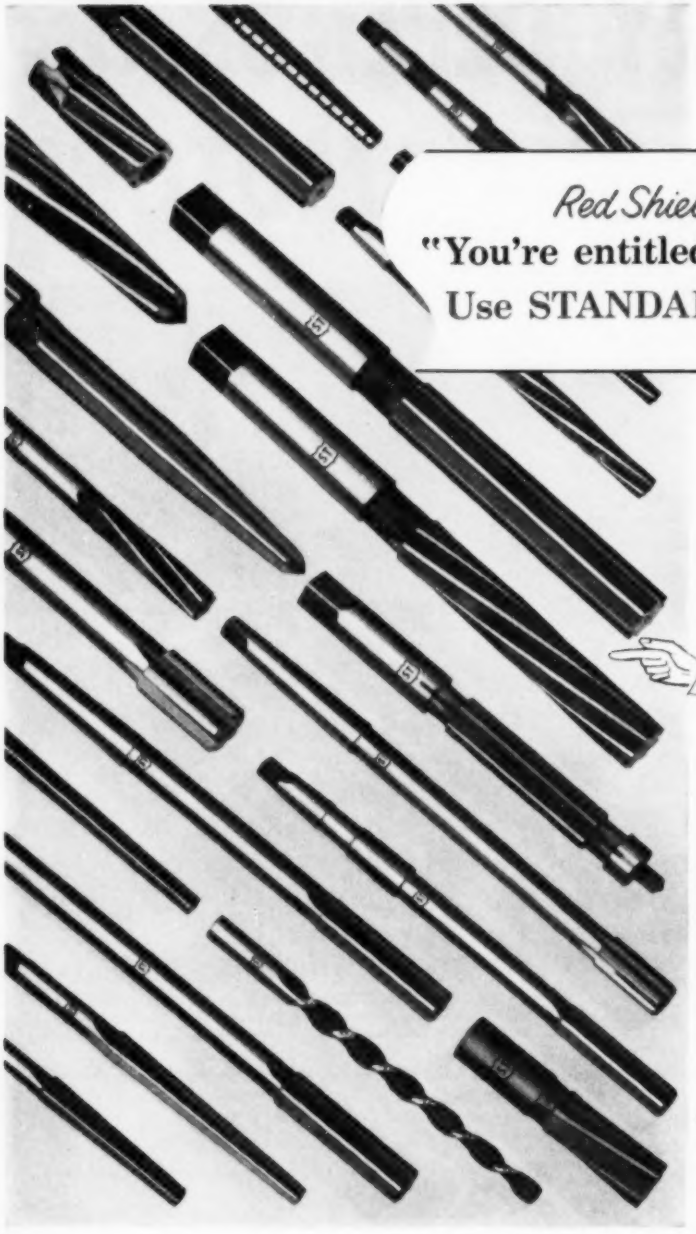
☐ GEA-4400 (Totally Enclosed Motors)

Name .....

Firm .....

Address .....

City ..... Zone ..... State .....



Red Shield says:
"You're entitled to the best–
Use STANDARD REAMERS"

Standardize and Save With Standard Red Shield Metal Cutting Tools. There is a Standard Distributor Near You and Ready to Serve You.

STANDARD TOOL CO.

3950 CHESTER AVENUE
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New York • Detroit • Chicago • Dallas • San Francisco

THE STANDARD LINE: *Twist Drills • Reamers • Taps • Dies • Milling Cutters • End Mills • Hobs • Counterbores • Special Tools*

Faster production at lower cost

New

MODERN COLLAPSIBLE TAPS

FOR EITHER STATIONARY OR ROTARY USE

- Easy and quick adjustment. No special tools required.
- Interchangeable shank for convenience in changing from one machine to another.
- Thread length setting undisturbed by diametrical adjustment.
- Extra rigidity with unusually sensitive collapse.
- Simple in design. No complicated mechanisms.
- Heavy chasers for greater strength. Chaser threads precision ground.
- All parts hardened and ground and precision fitted.

Modern Precision Tools Include . . . . .

STATIONARY SELF-OPENING DIE HEADS
ROTARY SELF-OPENING DIE HEADS
STATIONARY COLLAPSIBLE TAPS
ROTARY COLLAPSIBLE TAPS
MODERN-MAGIC CHUCKS AND COLLETS
SELF-OPENING STUD SETTERS
INSERTED BLADE FACE MILLING CUTTERS
SOLID ADJUSTABLE DIE HEADS
ADJUSTABLE HOLLOW MILLING TOOLS
UNIVERSAL CHASER GRINDING FIXTURES

Send for full information on this new improved Modern Collapsible Top and its cost reducing possibilities applicable to your tapping

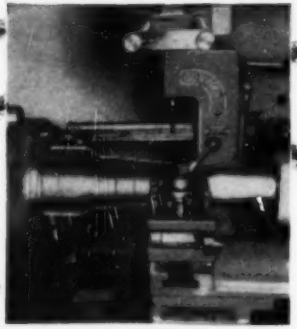
MODERN TOOL WORKS

DIVISION

CONSOLIDATED MACHINE TOOL CORPORATION

SUBSIDIARY OF FARREL-BIRMINGHAM COMPANY, INCORPORATED

ROCHESTER, NEW YORK



Canadian user reports

Lodge & Shipley

COPYMATIC

. . . increases production 186%

. . . saves 65% of time

. . . combines versatility of the hollow spindle with the productivity of the Copymatic

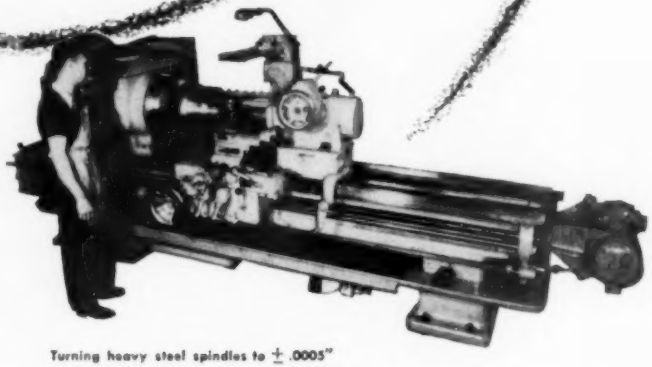
Here's still another on-the-job analysis of COPYMATIC accuracy and speed and Hollow Spindle Lathe versatility. Rough and finished turned inside and out, this heavy cast steel spindle comes down to 170 pounds finished weight with .0015" tolerance on diameters, ± .0005" on bearing diameters.

In the second operation, work is turned end for end and the small end of workpiece inserted in the Hollow Spindle.

Floor-to-floor time for complete turning and boring used to be 20 hours minimum . . . now it's only 7 hours.

Time and cost savings are reported by every one of hundreds of COPYMATIC owners surveyed. The convenience and speed of hydraulic duplication, combined with Lodge & Shipley "Model X" accuracy and versatility, make the COPYMATIC a profitable investment.

Ask your Lodge & Shipley representative to show you other case histories or write for Bulletin No. 675.

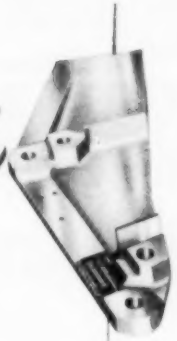


Turning heavy steel spindles to ± .0005" at Canadian Arsenals Ltd. Leaside, Ontario

THE **Lodge & Shipley** COMPANY

MACHINE TOOL DIVISION •
CHOREMASTER DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

where *Precision* counts

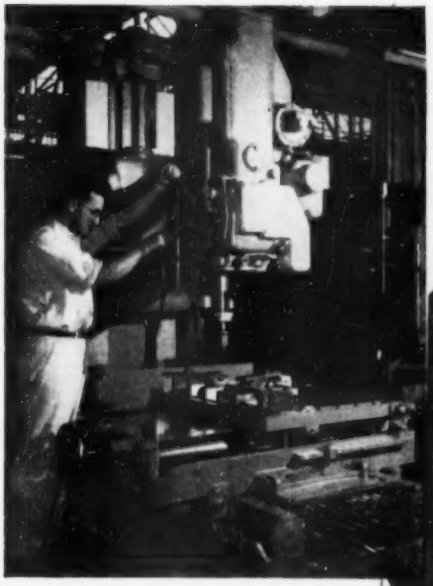


a natural combination hard to beat . . .

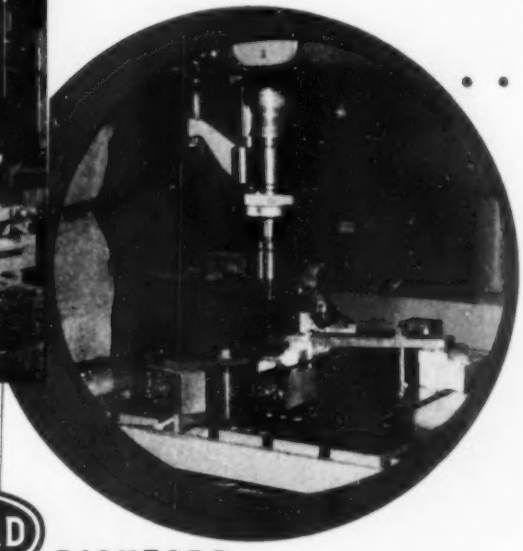
Bullard 30 x 20 Spacing Table installed on Cincinnati-Bickford fixed arm Precision Drilling Machine at Convair (Consolidated Vultee Aircraft Corporation, San Diego, California) is proving that these two units "pay-off" in elimination of jig cost, speeding-up production and accuracy in repetitive drilling on a variety of work.

A new job goes into immediate production with no lost time — no waiting for preparation of jigs.

Simple and comparatively fast change-over from one job to another minimizes production tie-ups.



Precision work materially reduces if not entirely eliminating spoilage and provides complete interchangeability of parts.



Again it's BULLARD BICKFORD

Ask either for information on this NATURAL COMBINATION

THE CINCINNATI BICKFORD TOOL CO., Cincinnati 9, Ohio, U.S.A.

. . . THE BULLARD COMPANY . . . . .

BRIDGEPORT 2 • CONNECTICUT

SAVE TIME AND OBTAIN WITH STERLING'S NEW

THE STERLING GRINDING

DESIRED FINISH FASTER ROLL GRINDING WHEELS

Sterling's Recently Introduced No. 3 Resinoid Bond Produces Astonishing Results . . . Eliminates Chatter and Burn

• Sterling's No. 3 Resinoid Bond, used for the first time in roll grinding wheels, is a most important, recent pioneering effort to be made available to manufacturers and finishers of steel mill rolls. Use of a special resinoid bond of this kind is unusual in the industry and marks a tremendous advancement over ordinary roll grinding wheels. With Sterling's No. 3 Resinoid Bond, there is created the ideal roll grinding wheel of soft, resilient action – yet one that holds the abrasive grain until all grinding efficiency has been used.

With this new member of the "Wheels of Industry," there is much greater control on the job. This unusual abrasive unit is setting new standards for faster, more accurate feed that cuts grinding time to a minimum.

These wheels containing the new Sterling No. 3 Resinoid Bond are not subject to "specification fluctuation." You can order them again and again, knowing you will obtain similar results every time. Their uniformity builds confidence in their continued use.

May we apply the proven excellence of Sterling's New Roll Grinding Wheels to your most troublesome problem? No obligation. Write us today for a wheel test on your machines.

BEST IN THE TEST --- THAT'S STERLING

Tested in the leading steel mill roll plants, Sterling's new wheels showed superior grinding ability. Sterling's 30x3x12 wheel, specification KA 801 K13 B3, used on alloy steel, cold mill reduction rolls, had the complete approval of all six operators on the test machine. This specification produced more than 2½ times as many rolls as were previously secured from other grinding wheels on the same job!

Sterling Engineers, skilled in recommending correct wheel specifications for your specific grinding project, can suggest the proper "Wheels of Industry" to solve any such problem quickly and accurately.

Send For These STERLING Research and Development Folders . . . .

Available at no cost, these new Sterling Research and Development Folders will be sent immediately upon request. They cover important suggested specifications for all types of grinding and include the popular "Art and Science of Grinding," now in its fifth edition.

WHEEL DIVISION TIFFIN OHIO

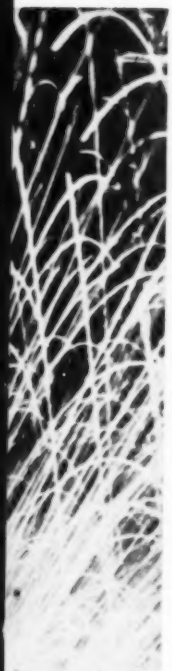
METALWORKING PRODUCTION SOLVES THE RIDDLES OF

how to conquer an ornery . .

The sparks fly at the American Welding and Manufacturing Company as titanium-alloy rings for General Electric jet engines are flash welded.

Photo courtesy of the American Welding and Manufacturing Company and the Titanium Metals Corporation.

...but wonderful...new metal



Even stronger than some alloy steels and much lighter... impervious to corrosion . . . able to keep its strength at temperatures many other metals can't take... titanium is industry's new wonder metal. But its eagerness to combine with almost every other natural element also makes it tough to work with. Grind it, and titanium tries to dissolve the grinding wheel. Machine it with a carbide tool, and it fights to eat the carbon in the tool. Weld it, and in a spectacular shower of white-hot sparks it gulps for all the oxygen it can reach.

For the latest reports on working with titanium, metalworking production executives turn naturally to the pages of *American Machinist*. And this magazine has been abundant in its help. Our first special report on "How to Work Titanium and Its Alloys" appeared in June, 1951, and gave metalworking production executives their first definitive round-up of production experiences and progress with titanium. This article has been followed by other farsighted articles on the forming, grinding, forging, drilling, and turning of titanium, as well as by the brilliant report in our May 26 issue on "How to Weld Titanium." As the horizons for titanium broaden rapidly, these articles are Metalworking's most complete source to the facts about titanium as a production metal.

And Metalworking will continue to turn first, and most often, to *American Machinist* for the latest news and ideas about titanium. Over 29,000 production executives in the biggest of all industries . . . each one a paid subscriber . . . *know* that no other metalworking publication gives them as many production facts and new ideas as this one does . . . whether these facts and ideas be about the working of titanium, or about any of the hundreds of other subjects important to them.

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American Machinist

OUR SEVENTY-FIFTH YEAR

1877-195

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Published every other Monday

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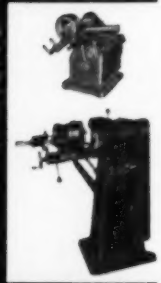

As Illustrated:

No. 21 Oliver Bench Drill Grinder. Hand operated for Drills No. 57 to ½

No. 310 For Drills ¼ to 3 – 2-3-4 flute

OLIVER DIE MAKING MACHINES

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Bench Model S-1 (Illustrated) – Single Speed Die Maker for use on Tool Steel up to 1" Thick.

Heavy Duty Model (Illustrated) – 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

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2 Models: Heavy Duty (Illustrated) and Standard.

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EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Free Lunch

I have a lot of respect for Fred Colvin, and even though I've never met him, I've read a lot of his books. I always thought of him as a hard-headed, factual writer, and even though I understand he also writes poetry, I never thought of him as a fiction writer in his last letter to fiction writer. But he sure became Backlash (*AM*—Oct 27 '52 p 86).

I know there are places in small country towns where the owner asks you how much you owe, but you had better be right, because he has had his eye on you and knows exactly how many slices of bread you took. But to ask us to believe that a bunch of city slickers would total their own bills is putting too much strain on our credulity. Don't mean to be insulting, Fred, but it's just too hard to believe, either in New York or California. Or did you, perhaps, intend it as a joke?

T J Crowther
Fond du Lac

We have checked with Mr Colvin, and he assures us that his statement is absolutely correct. The restaurant was, moreover, in the busy, financial district with a tremendous rush business, and several of our other editors recall eating there. It is now, however, out of business—Ed.

International Support

As another Belgian, also from Liege, may I answer my compatriot, R Potdevin, *AM*—Oct 13 '52, p100)? He says there should be some kind of international brotherhood between machinists. I'm all for it.

Were it not for brotherhood's sake, I'd feel tempted to assure Mr Potdevin—in a rather forceful manner—that the political situation has nothing to do with the publication in *AM* of articles contributed by foreigners.

Personally, I think *AM* never fails to give credit where it is due; never denies the spotlight to any good stuff, be its author from Paris, Melbourne, or Coronmeuse. Evidence: *AM* said that the Jeep made by Delahaye is better and costs less (when made in France) than the US version; that

GRINETICS

BY D. G. SMITH

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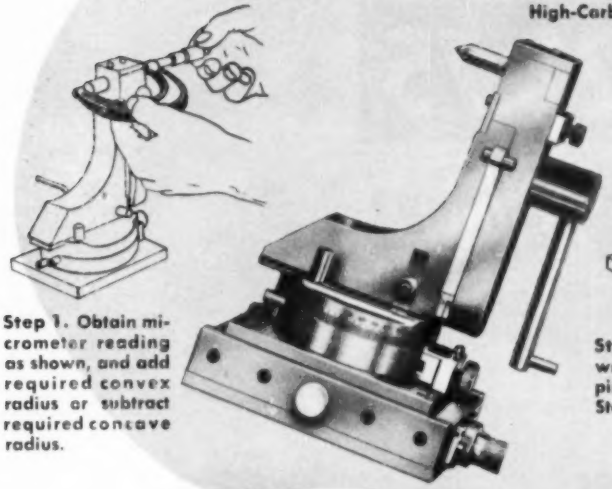
eliminate elaborate set-ups and operations

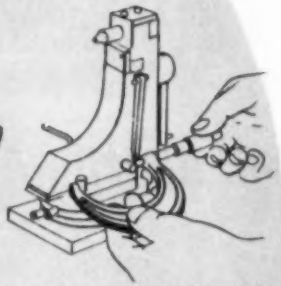
Fluidmotion WHEEL DRESSERS

dress two angles tangent to a radius in one continuous motion

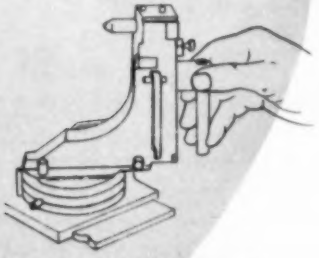
High-Carbon, High-Chrome Construction



Step 1. Obtain micrometer reading as shown, and add required convex radius or subtract required concave radius.



Step 2. Next loosen gib with wrench and "mike" over lower pins to reading obtained in Step 1.



Step 3. Tighten gib; set stops for two angles; ready for action.

ADAPTABLE TO ALL TYPES OF CYLINDRICAL AND SURFACE GRINDERS

With the unique "Fluidmotion" Dresser, you can dress two angles tangent to a radius—using one handle in one continuous motion. Operation is so fast and simple that beginners can use them to boost your grinding machine out-put. Forms are always clean, precise—angles and radii "flow" into each other. Contours are consistently sharp, accurate to .0001", without tool or chatter marks.

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Buckeye 360-cycle Right Angle Sander
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▶ SAVE $28.75

▶ on every new pinion!

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(also available in 180-cycle series)

On all electric tools, the pinion gear is subject to wear and replacement.

On many electric tools, replacing an inexpensive pinion also requires replacing an expensive rotor.

On Buckeye electric tools, the pinion is detachable and is easily replaced without even disturbing the rotor and shaft, which are dynamically balanced to insure smooth, quiet operation.

In short, whenever you do have to replace a worn pinion, you can save $28.75, plus a great deal of maintenance time and effort—IF you're using Buckeye electric tools.

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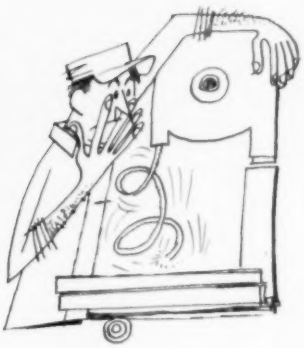
one American automobile manufacturer had its body prototypes designed in Italy; that in the UN army-rifle standardization row, the British-made rifle was the best. I'll bet a case of Piedboeuf beer that should a Russian machinist send in a good article, *AM* would publish it.

Recently, *AM* published a double-page article by Pierre Wilmus, La Hulpe, Belgium. Like the editor, I ask my English-reading compatriots: "What are you waiting for? Send in articles if you want them published."

Should Mr Potdevin care to correspond, the name is:

A T Renson
1651 Kenmore St. SW
Atlanta, Ga



No! No! No!

Would you please give me the answer to the following machine shop question? In our shop, two machinsts with long experience are saying that a power hacksaw blade can be put into a power hacksaw, first with the teeth facing one way, then taken out, turned end for end, and still cut metal. Can a power hacksaw blade be used both ways?

Also, one man says that cutting off a piece of wood will put a high-speed blade on the bum. I won't listen to them any more, so I would like to have somebody answer the question so I can show them what is the right way to use a power saw blade.

John F Bruton
Manchester, NH

Your friends are wrong. Look at a power hacksaw in action, or even a hand saw used correctly and you will see that the blade is lifted slightly on the back stroke. This is to prevent the teeth from rubbing and dulling. If you try to cut with the blade back to front, you will

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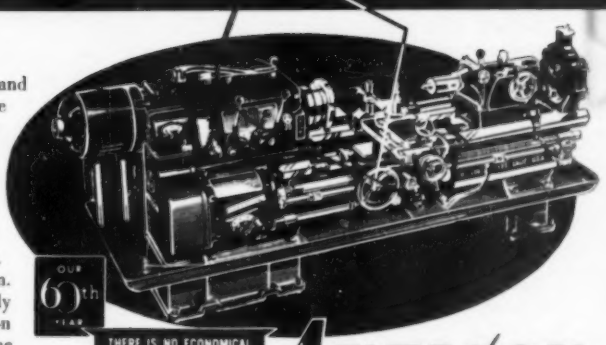
All Axelson precision apron gears, bearings and shafts receive adequate lubrication including the sliding bevel gears, which are immersed in oil. The apron, being wholly enclosed, eliminates chips, dirt and other foreign matter. The Axelson apron has its *own* pressure oiling system, with visual oil gage. This same system also delivers oil under pressure to the carriage ways, the cross slide and other critical areas. The split nut too, receives automatic lubrication. The oil pump and the apron clutches are easily adjusted from the front side. The same attention to detail carries through the entire Axelson Lathe line, where precision construction assures not only smooth operation, but also high resistance to wear and shock loading.



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Get more out of your machine tools . . . raise your production curve . . . with Gorham "M-40-B" turning tools! Use "M-40-B" wherever the application of a Super High Speed Steel is indicated, as in machining heat treated alloy steels with large amounts of stock removal at high surface speeds.

"M-40-B" is a Super Moly grade with performance characteristics comparable to those of super tungsten high speed steel. It has extremely high red hardness, high Rockwell hardness, and offers maximum toughness and abrasion resistance. You can take heavy roughing cuts with it at high surface speeds and feeds . . . use it for high speed finish cuts as well.

"M-40-B" comes in square tool bits, 11 stock sizes, and in 23 stock sizes of rectangular turning tools. Bits and turning tools are accurately ground, uniformly hardened, ready to sharpen. Special sizes and shapes to your order. Illustrated with prices are three popular size "M-40-B" tool bits. See your distributor, or send direct for a trial order.

"M-40-B" is one of three cutting tool materials developed by Gorham. Others are Gorham "Standard", for the commercial field, and "Gormet", for turning soft or abrasive stock. They're completely described, with size and price lists, in a new free bulletin. Send for your copy today.

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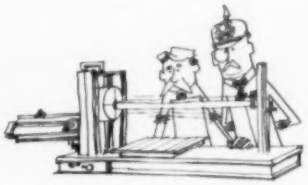
get a mere scraping action and the teeth will be worn at the sides, losing their "set." When this happens, the blade will jam in the kerf, and either the teeth will break off or the whole blade will break. After all, a saw blade is just a series of little chisels. If you push a chisel forward it will cut, but if you drag it backward it will scrape and dull the edge.

As to cutting wood, they may be right. If the wood is fairly thick and hard, and of course it is cut without coolant, the blade can get so hot that the temper will be drawn. Then the teeth will be so soft that they cannot cut.—Ed.



Practical Then — And Now

In reference to the practical idea on boring internal clearance (*AM*—Aug 13 '52, p172) I wish to advise you that my father used this idea in 1914 and 1915 while employed at the Robert Bosch works in Stuttgart, Germany.

Where did he get the idea? Believe it or not, in the German edition of *AM* in 1913 (month unknown).

Henry B Walther
Dayton

More Tips

Since you first started publishing Tips for Top Shop Men, I have read them all with great interest and feel sure they have helped to make me a better foreman. My one regret is that I didn't cut them out and stick them in a notebook.

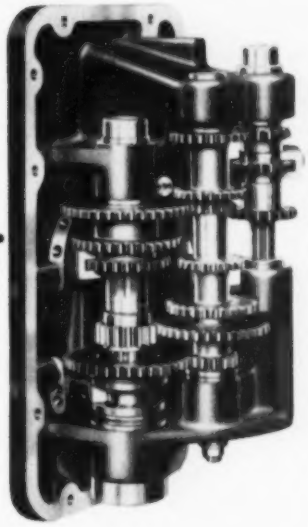
I know there are a lot of people who would like to have a collection of these items. Have you ever considered publishing them as a pocket-size book? You can put me down for the first copy if you ever do.

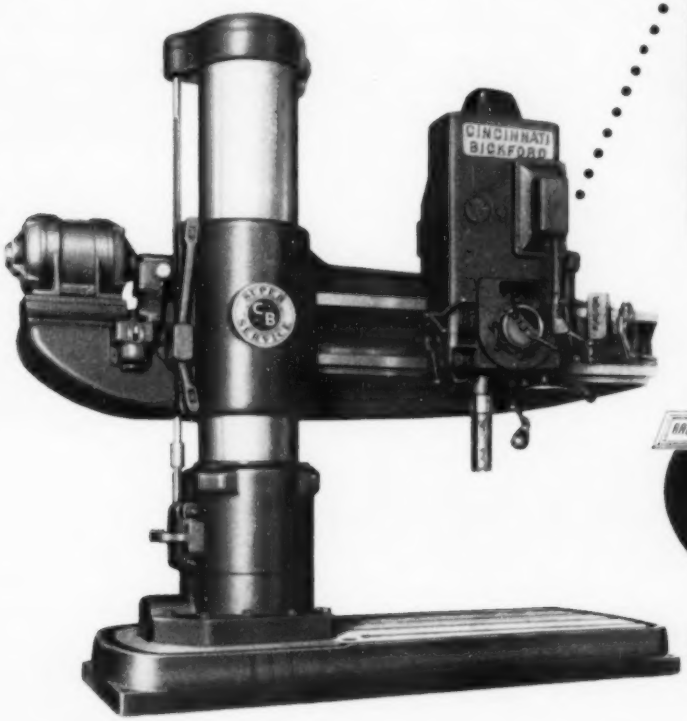
Robert R Simpson
Toronto

We have given some thought to the matter, but doubt whether sales would be large enough to justify the cost. However, there will be a large number of them reprinted in our 75th Anniversary Issue which has just been published.—Ed.

multiple **splined** *through-out*

This Super Service construction stands out in marked contrast to the previously accepted spring dive-key feed mechanism. The 18 feed changes are made through selective sliding gears, every gear being of heat-treated alloy steel, and every shaft is multiple splined. The superiority of the splined shaft construction is readily seen, with ease of shifting from one feed to another, efficient transmission of power without fear of shearing a key, and lower maintenance cost over long period of time. For further information on the many other patented exclusive features of the SUPER SERVICE RADIAL, write for Booklet R-29.





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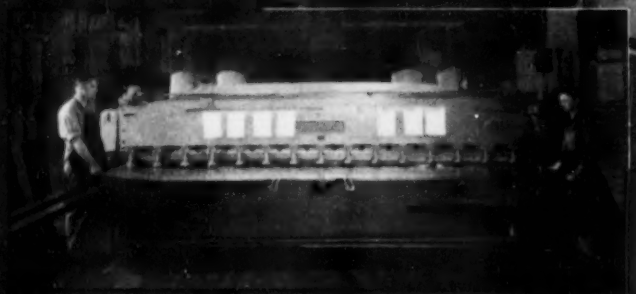
Special Stove

Three Cincinnati All-Steel Shears at Jamestown Metal Products Inc.



1814 Cincinnati All-Steel Shear with hydraulic holddowns, squaring arm and front controlled power back gauge.

is necessary...

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ACCURATE SHEARING

Jamestown Metal Products Inc. produces quality stainless steel equipment for hospital and home. Exact manufacturing standards are maintained.

Cincinnati Shears cut blanks accurately and to size for this equipment. Gauging must be rapid as well as accurate to handle the many different sizes required and keep production costs low.

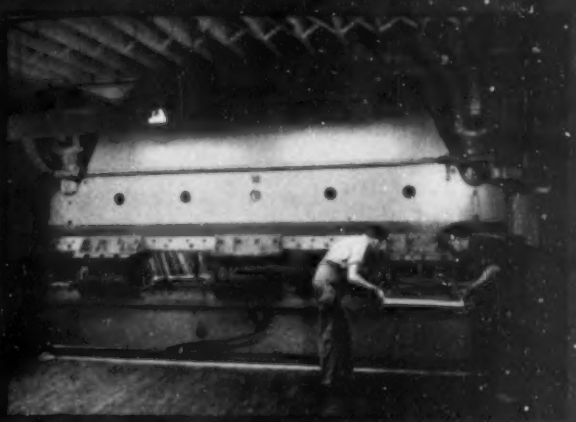
ACCURATE FORMING

Cincinnati Press Brakes form these blanks into accurate parts that fit correctly and insure outstanding quality in the finished products as well as maintaining low assembly costs.

You, too, can expect true blanks and accurately formed parts from this profitable team of Cincinnati Shears and Cincinnati Press Brakes.

Write for Catalogs S-6 and B-3, illustrating and describing these machines.

A row of Cincinnati All-Steel Press Brakes used in the production of these quality products



A 130 x 14' Cincinnati All-Steel Press Brake 14' 6" between housings tooled for multiple operations

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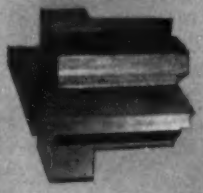
TO PRODUCE THESE *top quality products*

Slots, angles and compound angles are shaped to 0.001" limits on these solid 3140 forged steel tool holders.

Special index heads have slots accurate in shape, size, spacing and angularity to 0.001" on all dimensions.



Vee block fixtures of solid 6145 steel are completely shaped to very close limits.

Cincinnati Shapers do these jobs

The Jordan Specialty Company . . . Shaping Specialists . . . use Cincinnati Shapers exclusively. Outstanding accuracy and versatility in production are obtained in connection with low machine investment and low tooling costs. Due to the great variety of work produced, changes from part to part must be done with minimum loss of time. Here, Cincinnati Shapers give an exceedingly profitable and outstandingly accurate performance.

Write for Shaper Catalog No. N-5 covering the complete Cincinnati line.

CINCINNATI

THE CINCINNATI SHAPER CO.

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SPOT NEWS of Metalworking

- **Transistors, the new miniature replacements for electron tubes** in some applications, are being tried in nation-wide dialing systems by Bell Telephone, original developers of the mechanisms. Move indicates higher availability of the units, which could reduce size of electronic controls for machine tools tremendously.

- **Air-cooled welding torch developed by Navy** saves time in changing electrodes and makes disconnecting of gas and power unnecessary during gas-shielded inert-arc welding. New torch is small and light, made of insulating fiber and copper tubing. Electrode angle can be changed quickly from 180° to 105° by removing electrode holder, then attaching angle tip to simple threaded connection.

- **Continuous ferrous-metals casting machine will produce solidified slabs** or billets for production of tool, stainless, or other alloy steels. Equipment will deliver up to 15% more steel per heat than conventional pouring. Slab of infinite length can theoretically be cast, but gas cutting torches will slice this into desired lengths in practice.

Hydraulically controlled shovel attachment for tractors has been developed in England to fill the gap between hand labor and large mechanized excavators. Unit has 18- to 24-in. bucket driven by rear power takeoff on tractor, and controlled by three hydraulic valves that move bucket forward, up, and right or left.

- **Materials handling will be simplified by new belt system.** One section of belt support is a set of rollers, whose deflection is gaged automatically. Gage subtracts belt weight and feeds into electronic recorder that indicates total weight of material handled. Blending of two or more materials can be handled because of the weighing, controlling, and recording features of the device.

- **Helicopter passenger lines may be operating next year.** Air mail is carried by 'copters to 92 communities already by three companies, and at least two of them plan to add passengers to their cargos. First ships in service will probably be 12-place (or thereabouts) models. Larger 40-place ships are now slated for armed forces.

- **Ford will equip 1953 trucks with automatic transmissions** like Fordomatic on passenger cars, except that cooling system is linked with the regular engine-cooling circuit. Theory is that trucks work up more heat loss in transmission, and special provisions must be made to keep transmission cool.

German aviation will be reborn if agreement between Bonn and Allied authorities is reached to allow a German airline. Equipment will be modern foreign-built planes to be delivered early next year. Service will be to principal European cities, plus South America and south Asia, later to South Africa and Japan.

- **Japanese firms will bid on U S Army rocket shells** — 250,000 of them. Far Eastern Command is inviting bids from 14 Japanese heavy-machinery and potential munitions makers, including Japan Steel, Kobe Steel, Osaka Metal Industry, Komatsu Mfg, New Mitsubishi Heavy Industry, and others.

- **Department of Commerce is showing government-developed** inventions, including "memory" TV tube that retains a frozen image for any given length of time required. Tube was originated for use in electronic computers, but may have other applications.

- **Advertisement in "Berliner Zeitung" (eastern zone) appeals to readers** for help in finding vital bevel gear and axle-drive bevel wheel for a 5.5-ton truck belonging to the highly-touted "Iron Works East" company. Normal supply evidently couldn't replace worn gears, so newspaper ad was a last resort.

- **British Navy has completed successful tests of first diesel-driven combat aircraft,** a carrier-based three-seat anti-submarine plane, powered by a prop-jet engine. Only one fueling system is necessary for the combination engine, so extra safety is claimed for the craft.

Look for These Features in Drill Bushings

EX-CELL-O HAS THEM ALL

- **MATERIAL**—premium grade tool steel selected for greatest wear resistance.
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- **CONCENTRICITY**—assured by grinding on arbors after the holes are finished.
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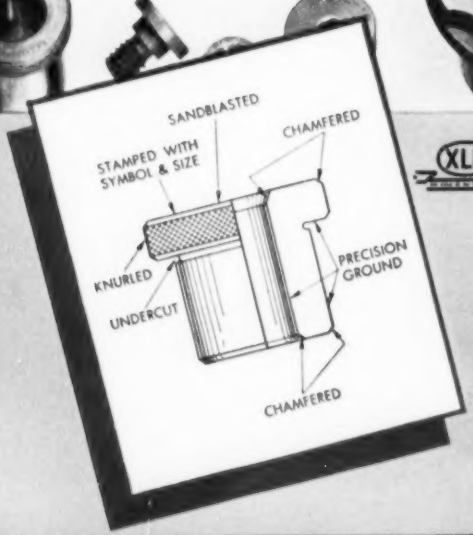
- **UNIFORMITY**—of material, dimensions, finish, and hardness assure accuracy, long life for both bushings and tools.
- **PROMPT DELIVERY**—from stocks of standard sizes in Detroit, New York, Los Angeles, and Toronto, Canada.
- **PREFERRED**—largest bushing users in the country are Ex-Cell-O customers.



Your purchasing and engineering departments should have copies of this Ex-Cell-O Bushing Catalog No. 35371. Just ask for the number of copies you would like.

EX-CELL-O CORPORATION

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RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT
AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

Washington

The change in Washington will be something different from what many businessmen now seem to be expecting. It's too early to be sure, but the major shift now shapes up as the end of the anti-business zeal of new-deal and fair-deal regimes.

• • •

Eisenhower is committed to carry on programs that will go far toward shaping the economy for years to come: The arms build-up, aid to our allies, resources development. He hopes to cut the costs of these with better, more efficient administration. But that's a long-range proposition.

At most, business can hope for a let-up in punitive action, both by Congress and by the executive agencies that deal most with industry. That will mean only limited gains in the near future, however.

• • •

Excess profits tax will go, for example, probably when it expires next June 30 under present legislation. That likely means 10-11% post-Korea income-tax boost also will not be renewed—it expires Dec 31, 1953.

But there's little chance of big tax cuts next year. The defense program bars that, and Eisenhower can't do much about arms spending for another year because of present obligations of the military. He probably won't even urge big arms cuts until prospects for peace improve substantially.

• • •

Emergency controls will go next year—on prices and wages in April, on materials in June. They were on the way out, anyhow. But look for standby controls—that Eisenhower can use in an emergency, providing Congress does not vote disapproval. Included will be standby credit controls, like regulation W.

• • •

Defense mobilizers are divided on what to do about steel for consumer goods. Some want to drop CMP controls by April. Consumer-goods makers use types of steel that'll be most plentiful by then—light gages of sheet and strip. Other officials are opposed to piecemeal CMP decontrol. They want to hold off until the general steel supply is better.

• • •

Steel warehouse inventories are 40% of normal. Main reason is still the summer steel strike. But warehousemen are griping about NPA's order requiring that 50% of a wide range of steel products be set aside for 15 days to fill defense orders. Trouble is that defense orders make up only 10% of warehouse business.

Air Force is setting up civilian committee to review spare-parts and components problems. Idea is to cut waste and excessive spare-parts buying. Move comes now because Air Force wants major share of 1954 defense appropriations now under review by the budget bureau. Congressmen last year charged Air Force with over-ordering spare parts even after need to stock them had long disappeared. So the review committee will recommend big reductions in components for reciprocating engines next year, for example. Similar reviews on personnel and construction will ease 1954 Air Force budget request through Congress.

• • •

Senator Taft will take charge of labor legislation in the 83d Congress, as he did in 1947 when Taft-Hartley was passed. He will get cooperation on the House side, too. Representative McConnell, who will head House labor committee, sees eye-to-eye with Taft.

Taft-Hartley will be revised, as Republicans promised. But not much. Not all the 28 changes Taft offered in 1949 will be pushed. Many of them were compromises which Taft, now on majority side, doesn't have to make.

Most Taft-Hartley changes will be technical, without altering its principles. Employers, like union leaders, will be asked to sign non-communist affidavits if they want to use the National Labor Relations Board. Economic strikers will get the right to vote in elections.

Industry-wide bargaining and labor monopolies will be target of business organizations. Congress will listen, but not likely do anything about this unless forced by another national crisis.

• • •

Manpower continues big defense question. Draft calls will be about 50,000 men per month through next spring. Chances are there will be no big cut in requirements before 1954.

Air Force wants 5,000 more reserve officers through next June 30. Most critical needs are radar bombardiers, navigators, and radar officers. Also on the list are security and intelligence officers, aircraft maintenance, communications, electronics, procurement, and supply officers.

• • •

Offshore procurement will be stepped up soon. US brass are beginning to feel that all arms-aid to Europe should take this form. That way, European industry could be rebuilt quicker, and US aid would be subsidizing only most efficient foreign industries.

Right now, offshore procurement is nearing $2-billion mark. But Mutual Security officials hope to see that figure doubled in two years.

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Detroit

Because Detroit was optimistic about 1952 to begin with, the election didn't change very much of the thinking and forward plans. The one hope now is that the administration will release controls on steel and other materials as fast as possible, and thereby permit expanded production by the second quarter. (Any move by the administration as soon as it gets into office in January wouldn't be soon enough to affect first-quarter schedules.)

There is more concern right now over the first-quarter situation under allocations than about a second quarter which might be without any. Initial releases for the first quarter have been enlarged by the government. But they are still feeble in comparison to past production totals. The auto companies are hammering Washington for more.

"Why don't they be sensible? — why don't they just reserve enough for their military requirements, then let everybody scramble for what's left. That way the people that need it would certainly get it." This is the prevailing Detroit view right now.

• • •

Manpower is an increasing worry in the automotive industry. There simply aren't enough people to go around.

You hear stories about second shifts planned, then abandoned because of lack of help. Instead, first shifts are going into overtime hours. You hear about advertising done every day, far and wide, with practically no results. (Some companies are keeping employment offices open on Saturdays so workers from other companies can conveniently apply.)

Detroit unemployment totals have gone down to the minimum point. Right now they consist largely of women and unemployables.

• • •

Truck production may have a more solid outlook than even passenger-car production. Dealer inventories of passenger cars are beginning to build up; but truck stocks, even though they have benefited from the broadest scale of operations in some time, are not increasing.

The gains are at both ends of the line — the light trucks and the very heavy ones. Apparently, markets for both these types have been enlarging steadily since mid-year. Medium-truck supply is a shade better, but the picture is strong nevertheless.

Truck-manufacturing volume for 1952 will be just shy of 1,200,000 units, and operations during the winter months will continue steady.

• • •

Passenger-car volume has gone still higher; it started November in a range around 150,000 cars and trucks, U S and Canadian production included. The month will not reach the 650,000 completions of October, due to a shorter number of working days, but on a daily-average volume, the total is higher. This will be subject to some reduction in the term immediately ahead, as various of the General Motors divisions change over.

• • •

A recent Detroit technical meeting was the scene of criticism by the top maintenance official of a major automobile company directed against producers of special machinery and equipment.

His position: that maintenance people are given no information at all about the make-up of the machine — the whereabouts and direction of oil, hydraulic, coolant and power lines; the progression of gear trains; and so on.

An equipment producer accepted the challenge then and there, pointing out that makers of special machinery took men off the boards as soon as their job was done, and assigned them to other jobs. "If we kept them working on a project, making diagrams and detailed descriptions such as you want," he said, "we couldn't afford it. There is never any provision in competitive price figuring for doing that sort of thing."

"We're willing to pay for it if we get it," shot back the company man. "It would be cheap at any price."

The matter rested there — both sides acquainted a little better with the other's viewpoint, neither quite satisfied.

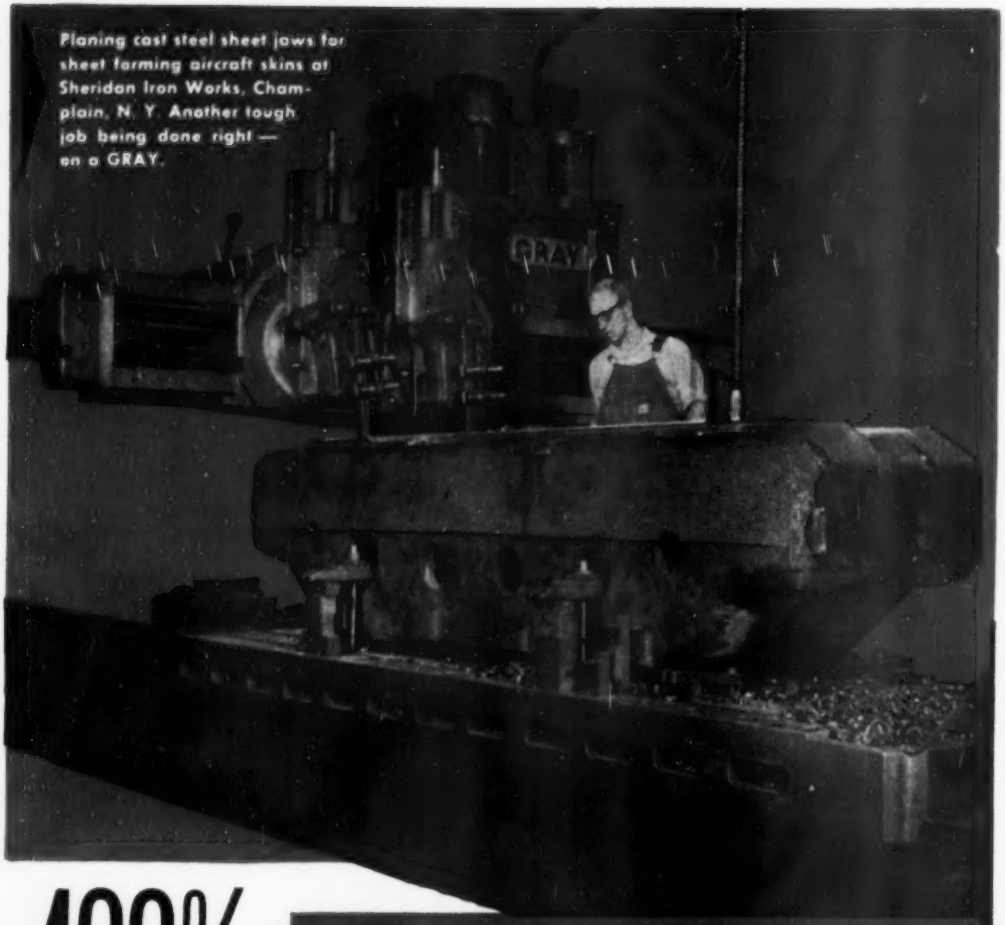
• • •

An index of automation: David A Wallace, president of Chrysler Div, reported recently on space efficiencies possible with transfer machinery installed on the new V-8 engine lines. In space previously occupied by old straight-8 production, capacity is now five times what it used to be; and productive capacity of 6-cylinder engines has increased about 15%, with no more congestion than before.

Another Wallace observation of note: The Chrysler FirePower V-8 "is getting very near the limits of practical design consideration for reciprocating internal combustion engines for automotive use . . . we see little possibility of any major design changes taking place. As a result, we feel that any extra expenditure that may be involved to automate these production lines may be amortized over production for quite some years to come."

• • •

Detroit automobile sales are showing improvement against comparative 1951 figures. For October, new-car deliveries totaled 12,640, against 10,515 in October 1951. New-truck sales were 1,251, against 1,227. Used-car sales were also up; used trucks somewhat down.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Machine Tools

National Production Authority has relaxed the rules controlling delivery of machine tools again. Builders hereafter will be able to divide their orders on a basis of 60% for the armed services, 40% for all other buyers. The ratio was 70-30 previously. But machines still on the critical list will remain exclusively reserved for military and other DO-rated customers.

These rules are even more liberal than they seem at first. From now on an unrated order can no longer be displaced on a builder's order board by a rated order during the frozen period. The liberalized policy indicates that defense-tooling requirements are being met well enough that a diversion of a higher ratio of shipments to non-military customers will not damage the defense program. It's also a recognition by Washington that many machine-tool builders are in need of orders to keep their shops busy.

• • •

The armed forces are talking of procuring $500 billion in machine tools during the next two fiscal years; 1952-53, and 1953-54. This would fix the extent of military purchases up to July 1, 1954 at $500 billion. The estimate is obviously subject to change, but it indicates Pentagon thinking at the moment. Just what the eventual purchases will amount to will not be known until military authorities decide specifically what items will be required and in what volume.

• • •

Offshore procurement of large-size shells in Europe is a problem that is causing considerable debate here. Just now, Washington is making its allotments for offshore purchases with shells looming prominently.

The program is reported to be stirring up interest from Sweden across Europe to France, where at least part of the planned shell production will be centered.

France is believed to have already placed forging-equipment orders in this country for two forge shops to be devoted to shell production.

The next problem is to get the shell-turning machines that are necessary. France hasn't any modern models. Some US builders had hoped to secure orders for these machines, and they may still get them.

But the French military officials are considering a Belgian shell lathe seriously, it has been reported. This may be produced either here or in France.

• • •

Two long-term programs are starting in Washington. One calls for creation of new capacity for long-lead-time machines—the so-called elephants. The other is for a major expansion in the gage-manufacturing industry. Both programs are concerned solely with the needs in case of a national emergency, including all-out war.

The program for long-lead-time machines roughly would involve these factors: The granting of a certificate of necessity for a 100% write-off of the new-plant construction, and Payment for the necessary production equipment by the government, which obviously would retain title. Expansion of gage-production facilities would be along the same general lines as for long-lead-time machines.

• • •

In both programs the manufacturers now making these products would be asked to participate. If they refuse, Washington expects to turn to other sources. The fact is that defense officials are convinced that the suggested added facilities are essential to the nation's safety. Therefore they have their collective heart set on proceeding with the programs despite any reluctance, if any, on the part of the companies involved.

• • •

The machine-tool industry will turn out, in 1953, about $1,050,000 worth of machine tools. Builders, as an industry, have on hand close to a year's backlog of orders, but the distribution of this business is uneven; and many builders must have more orders before long if they are to maintain their current schedules.

• • •

Press builders have had an influx of new orders in the past month or two. The volume in some cases has risen to a peak exceeded only once before since Korea. Most of this business is directly related to the defense program.

• • •

Ralph S Howe, retiring director of the metalworking equipment division of NPA, and two of his chief lieutenants, George E Merryweather and M R Swift, were given a farewell dinner in Washington on Nov 6 by their government associates and friends from industry. Mason Britton, president of the Metal Cutting Tool Institute, was toastmaster. Mr Howe will continue as an NPA consultant after returning to New Britain Machine Co as executive vice president.

At least two U.S. machine tool builders are considering the establishment of a plant in The Netherlands. The Dutch government is actively soliciting the manufacture of American products, pointing out certain inducements.

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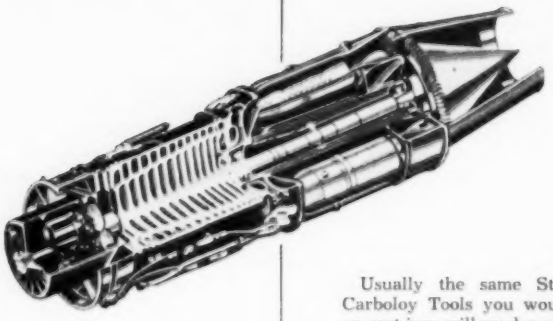

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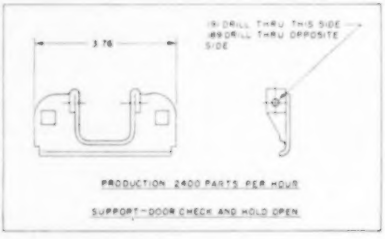

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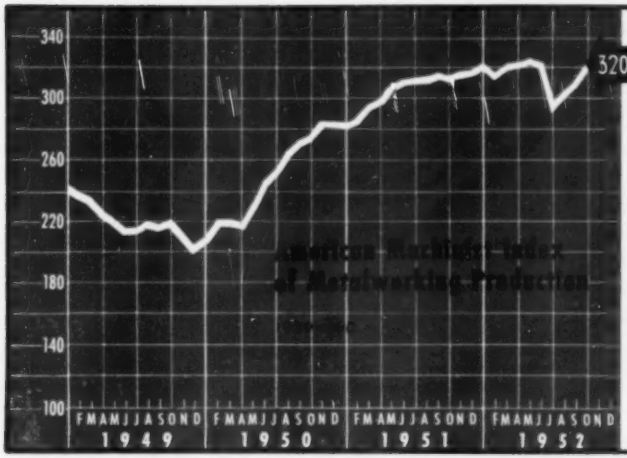
Gaging Metalworking



INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	OCT '52(*)	SEPT '52(p)	AUG '52(r)	SEPT '51
	320	**317**	**303**	**308**
Total Index	320	317	303	308
Machinery	298	298	302	
Electrical Machinery	365	354	345	
Autos	202	172	224	
Other Transportation	556	551	457	
Other Metalworking	314	302	308	

(*)Estimated (p)preliminary (r)revised

Business predictions for the months ahead, as a result of the elections, are mixed. Most of them are so worded that they don't mean much. Few economists will say, "Business is bound to be good for so many months," or "Things look bad after such-and-such a time."

The best gage for business is what the business man sees ahead. One thing he sees is a lot of competition; maybe more than ever experienced before. That's why the new emphasis on trained management people is noted. It's not that management is not as good as it ever was—it has to be much better in the future.

• • •

Labor is waiting to see what happens. There's been no tendency toward extra strikes because of the election, partly because labor doesn't want to draw Republican fire unless necessary, partly because plenty of labor is behind the new administration.

• • •

Steel production is still up—over 106% of rated capacity. Aluminum output was up over 2% in third quarter despite pot shutdowns because of power shortages. Copper is still a mess, but price controls on the metal may be dropped by year's end, and the price will probably level out somewhere under $.30 per lb.

Lead prices and demand are both up, and so is demand for zinc. Original DPA targets for zinc expansion were too high, and latest planning is more sensible—1¼ million short tons by 1956, which is 30% over the 1950 level.

• • •

CMP has dropped all but nickel stainless and heavy castings from "most critical" list. Mobilizers will want to keep controls on these past June 30, in addition to cobalt, columbium, molybdenum, nickel, tantalum, tungsten, and diamond bort, unless supplies ease up notably by then.

Second quarter of '53 will be last CMP allotment, but the machinery will be working just for effect by then because steel, copper, and aluminum will probably be adequate for most needs by that time.

• • •

Labor is critical, still, in shops that require skills. Tool-and-die shops are doing well, and could undoubtedly do more business if men were available. Jig and die work is swinging more and more to civilian goods, with appliance plants booming and calling for more service work from die and machine shops.

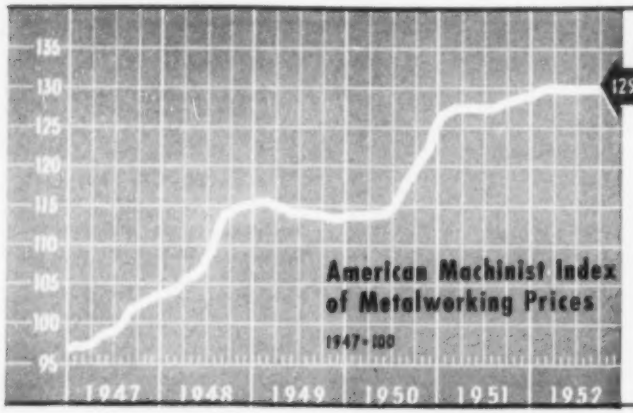
In forging the trend is up now that steel is easing. In heavy machines it is healthy, but builders of small machine tools are feeling a drop in future work.

Many assembly shops are still not at top work level because some parts are still lagging—delayed after-effect of the strike, and some labor shortages. The precision parts made of alloys are the stoppers.

• • •

One aircraft plant has a new thing in escalator clauses. Each upward swing pushes the top limit for each job with it permanently. Each downward swing can depress the scale, but pay progression can push a worker back up to the highest limit, even though the cost of living has not jumped again.

Gaging Business



PRICE INDEX

	OCT '52(*)	SEPT '52(p)	AUG '52(r)	SEPT '51
	129.7	**129.6**	**129.6**	**128.2**
Metalworking Machinery	137.9	137.9	134.2	
Other Machinery exc. Electrical	132.2	132.2	132.2	
Electrical Machinery	124.7	124.7	127.1	
Fabricated Metal Products	128.0	128.0	125.3	

(*)Estimated (p)preliminary (r)revised

1952 proved to be a hard-working year, and the short-term outlook right now is unusually good. The only low item—wholesale prices—is again on the upgrade.

Some fields took a beating during the year: Textiles because of large inventory and poor demand; steel and steel products because of the strike; coal because of big stocks; and paper because of declining demand. These didn't hit badly at any one time, so the total economy rolled right along.

• • •

Gross national product index is about 4% up over last year. The third quarter was the weakest since 1949, but it's up for the fourth quarter and will continue to rise about $3 billion each quarter through the third quarter of '53.

Capital spending will continue at high levels, and government spending will rise, though not too rapidly. Consumer goods will sell next year at the highest rate yet.

Here's the year's record, by industries, as measured by Federal Reserve Board:

Metal mining	up 6%	Stone, clay, glass	up 3%
Crude oil	up 1%	Textiles	up 14%
Iron & steel	up 3%	Leather products	up 7%
Machinery	up 4%	Foods	up 1%
Transport equip.	up 8%	Oil and coal prod.	up 5%
Non-ferrous prod.	up 10%	Chemicals	up 3%
Lumber products	up 2%	Rubber products	up 7%

The ones that went down were paper (1%), printing and publishing (3%), and alcoholic beverages (10%). Total FRB industrial-production index also went up 4% over last year.

• • •

Retail sales have finally beaten those for 1951, which was a record year. There was an early-'51 buying scare in the record, too. Personal income has been going up, so consumer spending next year will be another new record.

Retail prices haven't topped the July peak. Big factor is food, which carried the cost of living.

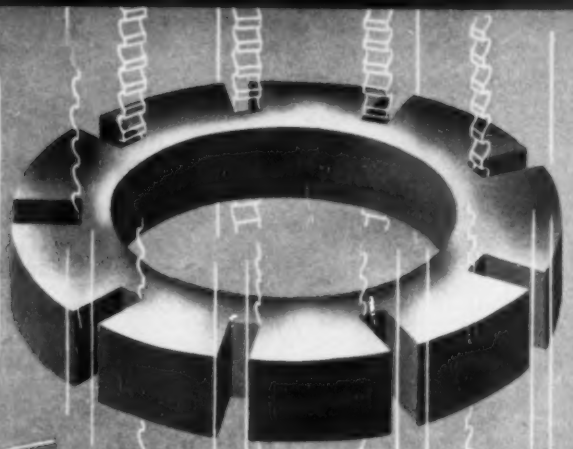
WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-25 = 100)*	248.7	248.9	230.1
Steel ingot production (thousand tons)	2,200	2,209	2,021
Electric power output (million Kilowatt hours)	7,807	7,753	7,396
Production of automobiles and trucks	147,664	155,037	117,342
Engineering construction awards (*Eng. News-Record*, millions)	$411.5	$195.4	$312.9

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	257	273	215
Vacuum cleaners sales (thousands of units)	238	222	210
Washers sales (thousands of units)	284	255	314
Household electric ranges sales (thousands of units)	64	77	96
Radio production (thousands of units)	866	544	1,100
Television production (thousands of units)	756	398	337
Gear sales index (1935-1939 = 100)	485.0	413.9	630.1
Foundry equipment new orders index (shipments, 1937-1939 = 100)	365.9	311.6	346.5

* Seasonally adjusted



Case of the Nine Drifting Slots

At Detroit Broach a baffling case came up recently—but it was solved in an ingenious manner.

A manufacturer found he was having considerable trouble holding close spacing tolerances on nine precision slots in the O.D. of a ring. When one slot at a time was made, the slot closed in afterward, leaving the slot undersized. This close-in made it difficult to hold spacing tolerances between the nine slots.

Detroit Broach was called in on the case, and after study, recommended that all nine slots of the nut be broached at one time. This was done on a vertical pull-down broaching machine. In contrast to common practice the work travels and the broaches are stationary in a special holder. In this manner the work is pulled through the broach holder and all nine slots are produced in one pass. Guides are incorporated in the set-up to prevent the work from drifting during the cutting operation.

This is just typical of the solutions made every day at Detroit Broach. If you have a special broaching problem, or if you would like further information on the cost saving advantages of broaching, it will pay you to contact Detroit Broach.

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MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Confidence, Not Fear, Should Rule

The American people gave sweeping approval on November 4 to a thorough housecleaning in Washington.

But General Eisenhower's election did not make everybody happy. Union officials and a lot of union members are glum about it.

They feel that the anti-labor element has been put into office. And they fear that labor may lose much of the gains of the past 20 years.

Some union officials have been talking in terms of battening down the hatches for a severe storm ahead. News stories have been printed about the possibility that unions, long opposed to each other, may end their feuds and present a united front to the anti-union tidal wave which may hit them.

THIS IS NO time for such thinking to take hold among union members or among the rank and file of metalworking employees. The worst thing that can happen is for fear to rule.

The best way to dispel such fear is to deal realistically with the situation on the local level. Metalworking management should boldly and quickly tell its own employees, if it hasn't done so already, that the coming changes in Washington will not affect at all the friendly relationships between the two.

Employees should be informed that management's attitude has not been altered in the slightest by the current political upheaval. Management will be as ready and willing as ever to listen to its employees and to talk over mutual problems with them.

IN THE COMPETITIVE days ahead, management will need the cooperation of all employees in working together for a common purpose. If management intends to operate an efficient manufacturing business, it will want the highest possible productivity from every worker. That will keep costs down and contribute to increased profits.

Of all the factors comprising productivity, the attitude of the worker is the most important. If a working force possesses a spirit of teamwork which comes from a friendly relationship with management, that alone will do more than anything else to boost productivity.

Thus management has a selfish stake in assuring its employees that the momentous political decision on November 4 means no change whatever in the cordial relationship between the two. If anything, more responsibility than ever before rests upon management to see that fairness and consideration rule in dealing with employees.

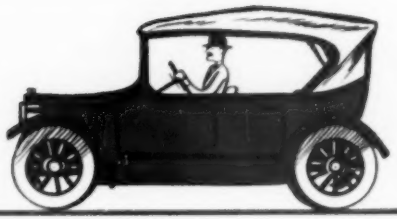
IT WILL EVEN pay for management to lean over backwards to demonstrate to workers that confidence, not fear, should prevail during the days ahead when a brand new administration takes over in Washington.

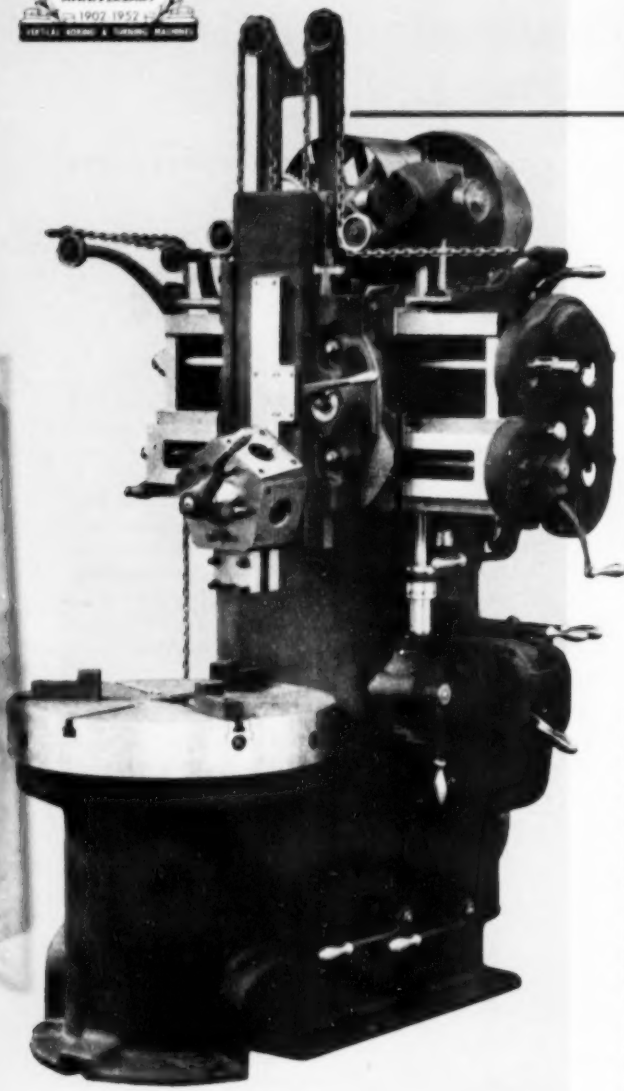
Burnham Finney

KING

50th ANNIVERSARY

1907 1952





Get prompt repair service for this 1919 "Gas Buggy"?

Impossible!

But NOT IMPOSSIBLE for this 1919 KING

Here's a typical example of KING long life, and what KING customer service can mean. Recently we received a phone call from one of our fine customers in Akron, Ohio, telling us of a breakdown on their 42" KING—Serial Number 1801. A new operating nut, shaft and sleeve were urgently needed to get this KING back in service. Anything we could do to help would be greatly appreciated.

A quick check of our records told us that this KING was delivered in 1919! *Thirty-three* years in service! Yet we called this customer back the same day, and reported that the needed parts would be shipped in 96 hours!

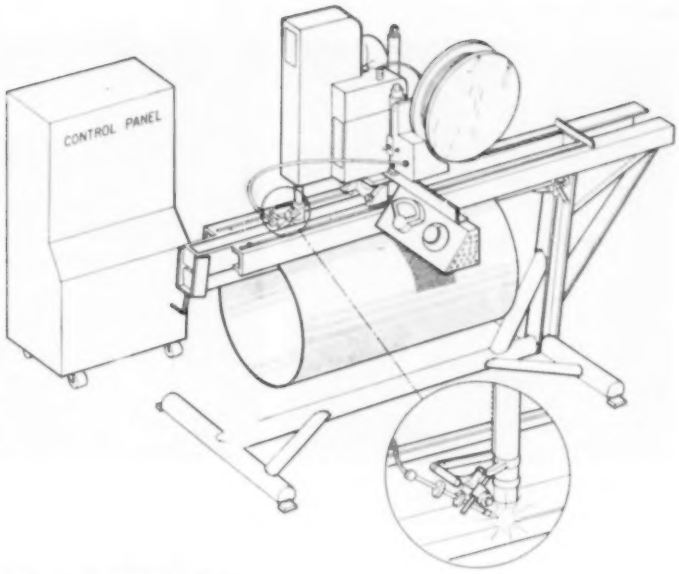
If defense-rated orders are keeping you from obtaining the new KING Vertical Boring and Turning Machines you need, let us help you maintain your production schedules by keeping your old KINGS in good condition. There are many KING Mills in service, dating back to 1906, for which we still supply repair parts. Can we help you service your KINGS?

New Series KING Vertical Boring & Turning Machines are available in ten sizes—30", 36", 42", 52", 62", 72", 84", 100", 120", and 144".

American Steel Foundries

KING MACHINE TOOL DIVISION

CINCINNATI 29, OHIO



Heliwelding of longitudinal seams is accomplished in two passes in this jig adapted by Bell tool engineers from a setup originally designed to make 4-in.-dia tubes. Argon protects top of weld and helium envelops bottom of weld to prevent oxidation

INGENIOUS MACHINES WELD THIN-WALL STAINLESS TANKS

BY ROBERT L BROWN, Assistant Foreman
Experimental Department, BELL AIRCRAFT CORP

Special jigs and specially designed machines have licked a difficult problem. Overlapping spotwelds replace regular seam welds for pressure-tight joints

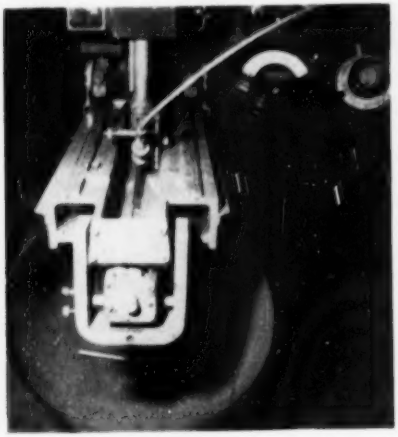
Improved test models of guided missiles designed by Bell Aircraft use fuel and oxidizer tanks welded from 0.078-in.-thick Type 410 stainless steel. This material is necessary to withstand the corrosive acid and oxidizing agents to be carried, and to permit light weight with maximum strength.

Because of sheet size limitations, the tanks are made in two cylindrical halves, each containing a dome end resistance-seamwelded in place. Several bosses are welded on the tank wall, and one end dome has a 3¼-in outlet boss, and the other an 8-in. boss with a 5⅜-in. hole. Doublers, 0.050 in. thick, are welded in proper positions to provide bearing spaces for the flathead screws used for mounting.

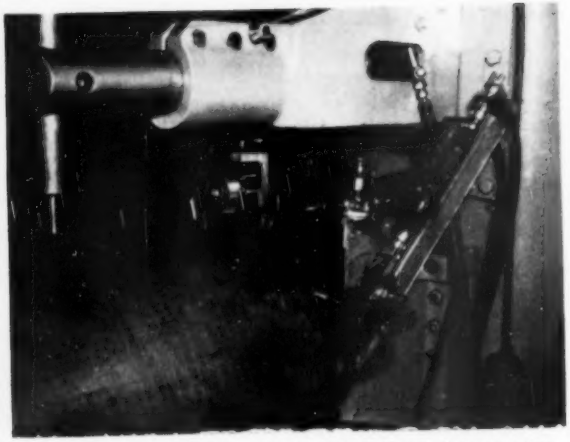
Sheets are sheared to templets, which are 0.020 in. oversize to allow for shrinkage, boss holes are pierced, and the sheets are rolled to form cylindrical shapes. Next, edges are cleaned with emery cloth, and the sheets are carefully degreased.

First welding operation consists of welding the longitudinal seam to complete the open-end cylinder. This is performed in a special jig which was adapted from a tool originally designed for welding a 4-in.-dia cylinder. It now has a steel backup bar with a 5/16-in.-wide, 3/16-in.-deep groove with 1/16-in.-dia vertical holes in the bottom spaced 2 in. apart along the bar. These holes are connected to a copper tube manifold under the bar which supplies helium to protect the underside of the weld from oxidation.

The jig consists of two welded-steel box-beam assemblies placed side by side to form the upper section of the holding clamp and to support rails along which the welding head traverses. Under this is the steel backup bar, hinged at one



Longitudinal seam welding jig has split upper clamp beam to support and guide Heliweld head, and hinged backup bar that is clamped in welding position with section of hose expanded by air



Powered with air cylinder converted from P-63 cylinder, and using a gearbox from a washing machine, this mechanism indexes tanks for proper spacing of overlapping spotwelds. Movement of upper arm of welder trips switch to energize solenoid valve at cylinder

end to permit loading and removal of the tank shell.

When a formed wall sheet has been positioned in the jig, air at 100 psi is admitted to a section of fire hose under the backup bar, to raise the bar and clamp the shell against the two upper beams. A maximum gap of 1/32 in. between sheet ends can be tolerated for welding. Before the section is clamped, 2 x 2-in. starting and stopping tabs are positioned at each end of the joint so a full weld will be obtained at both ends.

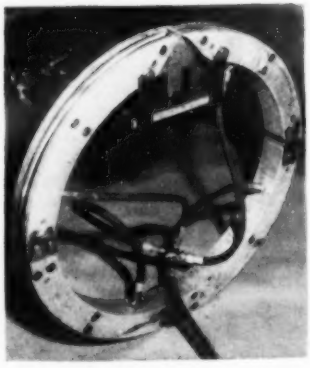
An Airco automatic Heliweld head and wire feeder are mounted on the track rails and are connected electrically with an automatic Heliweld control panel and amplifier. When the weld switch is turned on, the torch automatically advances, touches the work, and then retracts to draw an arc between the 3/32-in.-dia tungsten electrode and the work. The control panel and amplifier then electronically measure the arc voltage and automatically move the torch up and down to maintain this voltage. This insures a constant, well-shaped bead without undercut and with the proper penetration.

When the arc is started, the carriage feed motor and wire feeder motor also are energized, so the torch will move along the rails and the stainless steel filler wire will be fed at proper speeds. Two operators control this welder. One adjusts a remote-control rheostat to increase the welding current to proper value, and adjusts the wire feed rate according to instructions from the second operator. The second man, working at the controls beside the welding head, keeps the torch aligned with the seam, adjusts the wire nozzle to keep the filler wire feeding directly into the weld puddle, and advises the first operator on needed adjustments in current and wire feed rate.

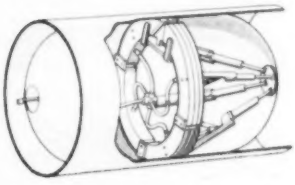
Using a 1/32-in.-dia bare Type 410 stainless steel filler wire, shielded with argon, and feeding at 50 ipm, with 160-amp welding current, the first pass is made at 19 ipm. On the second pass, wire feed is increased to 61 ipm and welding current to 180 amp. After this operation, the shell is X-rayed and any defects are ground out and repaired with a hand Heliweld torch, using a funnel-shaped helium gas backup. Defects are rare.

Finishing operations on the shell include: annealing, rounding and sizing by pushing a Masonite plug through the shell, trimming ends to length, hand Heliwelding bosses in place, X-raying all welds, and correction of defects.

A press-formed dome end then is positioned in each shell, using a



Four-section fixture inside tank is expanded by screw-adjusted wedge to align both tank halves for welding girth seams. Fixture can be taken apart and removed from welded tank through access hole. Four toggle expansion bars support fixture from dome end. Hose supplies helium to grooves to protect underside of weld



special locating fixture, and resistance spot tackwelded at eight points. Doublers outside the ends are tacked in the same setup.

The next operation originally was resistance seam welding the domes to the shells. But high-strength, crack-free welds of good metallurgical structure could not be made on the machine available—and we couldn't find a subcontractor with a suitable machine who could undertake our low-quantity production run. At that time we were lagging behind our production schedule slightly because of material delivery delays—so we had to find an alternate method of doing the job.

Overlapping Spotwelds

Bell's spotwelding department suggested overlapping spotwelds, a method that had been tested and approved several years ago on another project. Tests on the thin-wall fuel tanks proved that these would be satisfactory if the spot spacing could be controlled with sufficient accuracy.

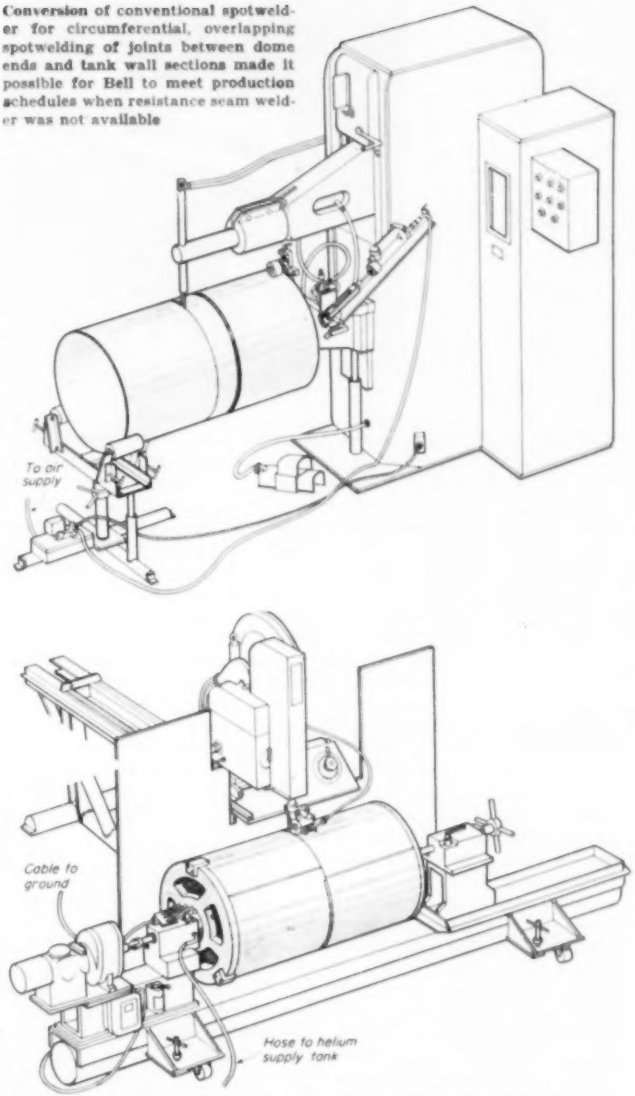
One supervisor suggested and designed an indexing head incorporating a worm wheel drive. This was fabricated from scrap parts around the plant. Suitable gears were not available, so one of the men brought in a set from a discarded domestic washing machine. Design was kept simple to minimize machine time, which was at a premium.

Originally, indexing was by a hand crank connected to the worm in the gear box. A 1-in.-thick, 2½-in.-dia steel wheel was fastened to the worm wheel with insulating pins, and separated from it with a 1/32-in.-thick phenolic washer and bushing. The inside of the tank wall rests on this wheel. Another similarly insulated wheel is mounted above the first wheel, to bear on the outside of the tank, and is supported by a hinged arm to permit loading and unloading. A screw adjustment supplies pressure to the upper wheel to insure a positive drive.

This indexing device is mounted on a track bolted either to the lower arm of the spotwelder, or to a pipe stand lagged to the floor in front of the machine. By turning the crank ¼ revolution, the tank was rotated the proper amount for correct overlap of the spot welds. But hand indexing was slow.

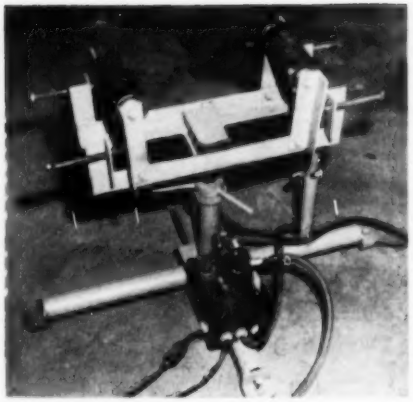
To increase the production rate, an air cylinder equipped with a solenoid control valve was added, with a ratchet wheel to replace the crank. A Micro Switch was positioned so movement of the upper arm of the spotwelder would control movement of the air cylinder. The cylinder was a war-surplus brake cylinder from a Bell P-63 warplane. Some parts were removed, and others were reworked

Conversion of conventional spotwelder for circumferential, overlapping spotwelding of joints between dome ends and tank wall sections made it possible for Bell to meet production schedules when resistance seam welder was not available



Rotating fixture for girth seam is mounted on casters for easy positioning under head of longitudinal seam welder. Spindle is rotated by **geared head** motor through gear reducer. Tailstock is adjustable for different lengths

THIN-WALL STAINLESS TANKS *continued*



Adjustable outboard support which holds tank level for overlapping spotwelding of circumferential joint between dome end and wall was made up from surplus parts found in shop scrapboxes. Adjusting screws permit setting rolls for different tank sizes

to form a spring-return, $\frac{3}{4}$-in.-dia, single-acting air cylinder with a $2\frac{1}{2}$-in. stroke. A repairman found a ratchet wheel to replace the crank. So we were equipped for automatic indexing.

It was necessary to support the outer end of the shell during spotwelding. So two ball-bearing rollers from a surplus conveyor were mounted on a vertically adjustable stand. Adjusting screws in the roll support assembly permit setting the rolls for different tank sizes, while an adjusting screw in the pipe legs of the assembly permits raising and lowering the rolls.

Slight out-of-roundness of the tank was found to cause a slightly irregular pattern of the overlapping spotwelds, so a Micro Switch and indicating light were mounted on the lower electrode arm inside the tank. When the light is off, the operator lowers the tank; if the light stays on, he raises it. If the light flashes on and off with each spotweld, it indicates the setup is at the proper height.

The sequence timer of the spotwelder is set so repeat time is sufficient to allow the air cylinder to actuate the indexing device before the upper arm is lowered to make the next weld. To prevent cracking at the start and end of the seam, the pulsation timer of the machine is turned on for several spots, then switched over to plain spotwelding sequence. Both domes and doublers are overlap spotwelded to produce a liquid-pressure-tight joint which passes all necessary tests. Again, all welds are 100% X-rayed, and any cracks are repaired before further work is done.

The two tank halves then are ready for joining with a circumferential seam. Joint surfaces are trimmed to length, cleaned with emery cloth, and degreased. Then an expansion fixture is positioned into one tank half with C-clamps. Toggle expansion clamps with adjustable extension rods are positioned to support the fixture from the dome end of the tank and prevent its falling in after the C-clamps are removed. A wedge is forced between two sections of the fixture to expand it against the tank wall.

Finally, the second half of the tank is positioned, lined up with centerlines, and the fixture inside the tank is expanded further with a 4-ft ratchet wrench inserted through the $5\frac{3}{8}$-in. hole in the dome. This locks the two halves together while they are tacked with hand Heliwelding. The assembly then is moved to the automatic circumferential seam welder which supports the tank horizontally between centers and uses the same automatic Heliweld head as is employed on the longitudinal seams.

Helium is supplied to the underside of the girth seam through a circumferential groove in the expansion fixture inside the tank. A hose connects this groove to the headstock wheel of the welding machine, where two rubber O-rings prevent leakage as the spindle rotates. Three large motor brushes ground the rotating headstock spindles, preventing heating of the bearings.

The automatic Heliweld head is pulled over the tank on an extension of the longitudinal seam welding jig, and a wax pencil mark is put on the tank wall to indicate the start of the girth weld. Two operators control the welding machine, as before.

The tank is rotated at 15 ipm, filler wire is fed at 50 ipm, and controls are set for 150-amp welding current for the first pass. Without stopping, controls are readjusted as the seam passes the wax pencil mark, to apply a second bead with 55-ipm wire feed and 160-amp current. Speed of rotation is not changed for the second weld.

Fixture Removed

When this weld has been completed, the assembly is removed and the fixture inside the tank is removed through the access hole in the end. The weld then is inspected for complete penetration on the inside, using an extension light and a mirror. Outside weld surface is inspected visually with a 20-power magnifier for cracks and undercutting. Then the weld is X-rayed.

Final operations, after all welds have been approved, include: (1) annealing, (2) hydrostatic pressure testing for leaks, (3) heat treating to 170,000 psi for 1 hr at 1800 F in helium atmosphere, air quenching, then tempering at 700 F for 2 hr, (4) machining—facing to length, and facing, boring and tapping bosses, (5) hydrostatic pressure testing at 1000 psi with no visible distortion — volumetric recovery must be in excess of 90% of total volume, (6) pickling inside and out, and (7) coating with zinc chromate primer.

Use of the overlapping spotwelds to produce a resistance seamweld enabled us to meet production schedules at a time when a new seamwelder suitable for the job could not have been obtained without a delay of 30 to 48 weeks. And, incidentally, the seam welder would have cost more than $50,000. So considerable money was saved, because the cost of the rotating device was only about $500.

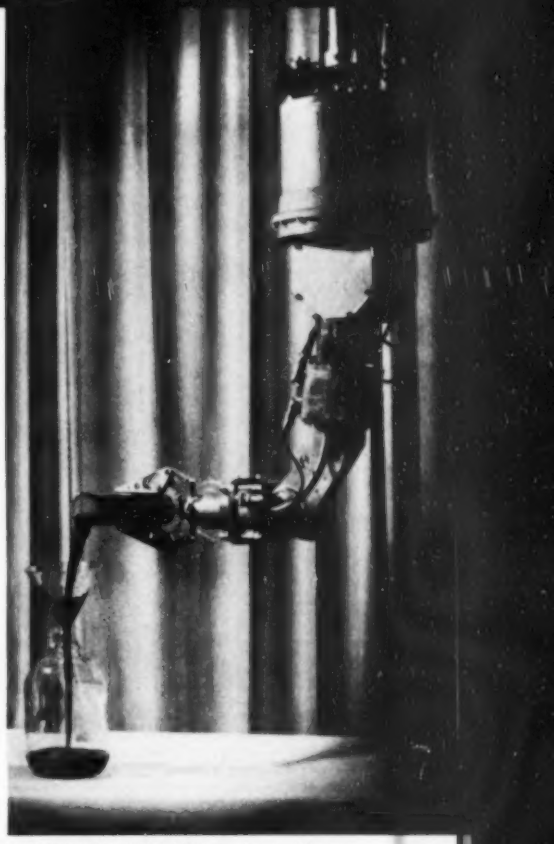
Strong, yet Delicate ...

AN ARM WITH MECHANICAL MUSCLE

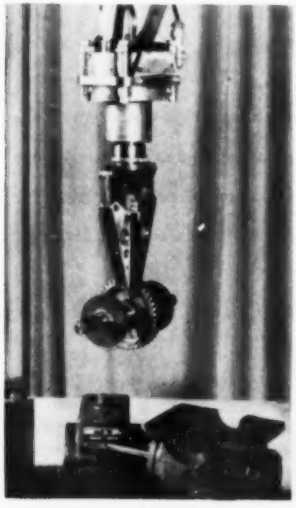
A highly versatile mechanical arm capable of handling objects ranging from eggs to motor blocks has been created by General Mills. Its chief advantage is an ability to perform in places where human hands cannot go because of heat, radiation, flying particles, or other hazardous conditions. Because it requires only electrical connections to its control source, it will function at a great distance from the operator.

The arm also can do heavier work than a human. Its "wrist" can make continuous revolutions to the right or left. The arm can move through wider angles than a human arm and maintain a set position for longer periods of time. In performing simple motions, it works with greater accuracy than a human hand.

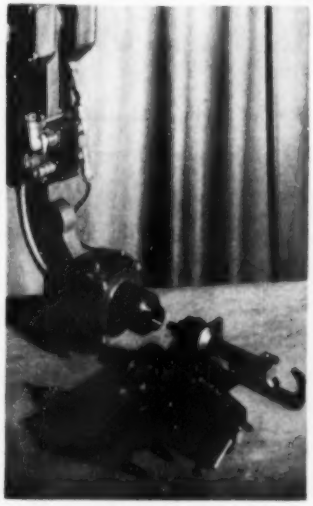
The upper arm is crane mounted and can rotate through four revolutions to the right or left about a vertical axis. The "shoulder" joint allows the arm to swing through an angle of 180°. The "elbow" joint can bend 110°.



MECHANICAL ARM'S GRIP can be as delicate as an artist's. A device in the arm measures the amount of grip and translates it into an electrical impulse by means of a sliding contact on a commutator which varies the resistance in the circuit. A meter on the control panel, calibrated in pounds, tells the operator how much force he is exerting

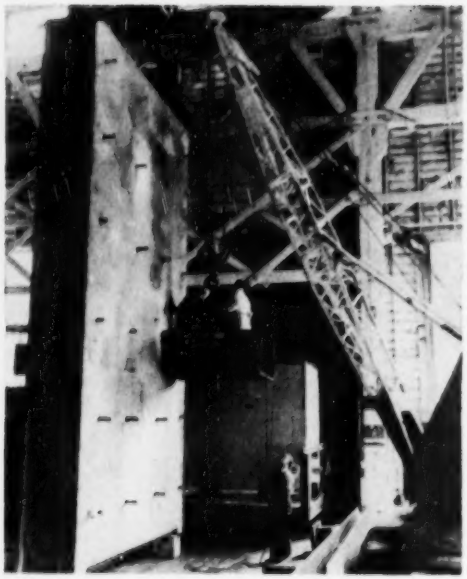


THE UPPER ARM AND FOREARM of the unit together are nearly 3 ft long. When both are extended horizontally, they will lift 40 lb. When both hang vertically from the mount, 750 lb can be picked up. With the elbow at 90°, lift is 75 lb in any position. Rotation of the upper arm and joint movements are driven by six motors

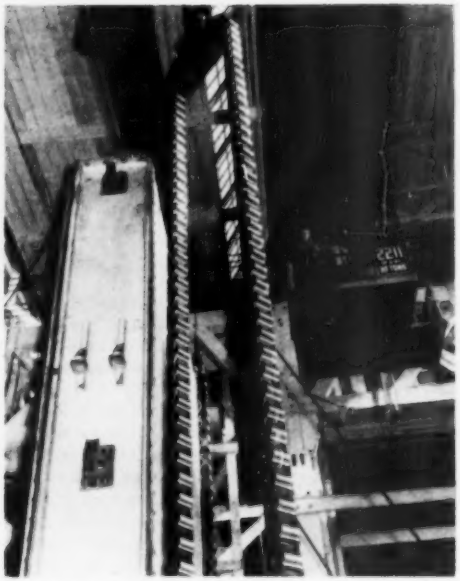


TWO DIFFERENT HANDS can be used, with the machine able to switch from one to the other under remote control. The stronger of the two consists of a grooved anvil that closes against a hook-shaped steel finger. It is primarily used for holding tools. The other hand has two parallel fingers which close together with a pinching action

ALL MOTIONS are directed by one control handle, shaped like an upside-down pistol grip. The handle is used somewhat like the control stick in an airplane—push the handle forward, and the arm swings forward, with other motions directed the same way. The hand's grip is controlled by two small buttons near the top of the handle. The other control shown directs crane motions



GATE LEAF, before tracks and rollers are added, is checked for deflection. Welding stresses have been removed in furnace, with leaf welded to strong back. Leaf must hang plumb within ⅛ in., so weights are added to downstream side



FOUR TRACKS ARE POSITIONED and bolted on, then two roller assemblies are lifted into position. Steel-plate liners to 0.004-in. tolerances are slipped between leaf and rollers at top and bottom to tighten chain so action will be clean

DAM TOOLING TURNS OUT TOUGH

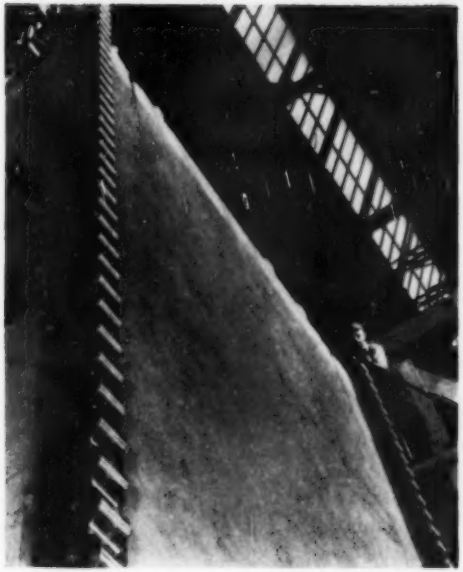
Tractor gates for the Garrison Dam, 80 miles north of Bismark, ND, on the Missouri River, were fabricated at Westinghouse's Sunnyvale (California) plant. There were two main problems: The steels were stainless, therefore were unusually tough; and the precision requirements were surprisingly high for so massive a job. The tooling used to produce the ten gates shows good planning and practice

By G. W. HILTON and THOMAS SHIELDS, WESTINGHOUSE ELECTRIC CORP, Sunnyvale, Calif.

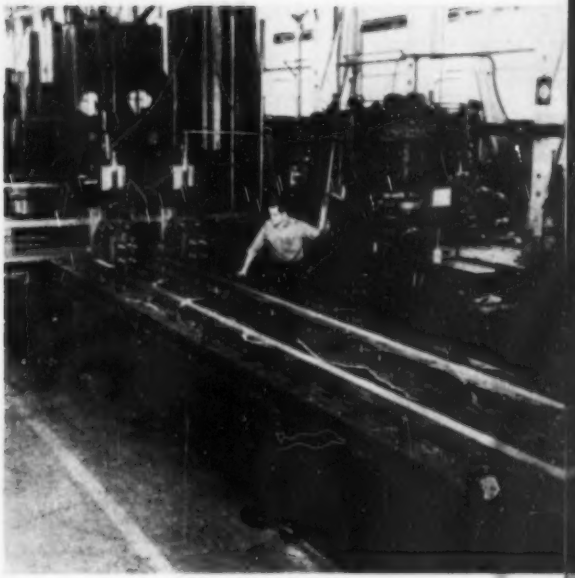
ALL jobs done on the dam gates were unusual and difficult, but one problem not illustrated in photos and captions here was the cutoff operations on bar stock that was formed into rollers. Ordinary sawblades wore excessively when the 20-ft sections were originally cut to roller length, so highly tempered blades, flooded with about 50% more coolant than normal, were installed. These were removed from service after cutting ten rollers, regardless of individual wear, to insure accurate cutting.

Lathe tooling for all operations, including facing and turning tools, was removed from service at a regular rate, based upon past experience. The unusual drill was pulled from the machine after cutting 40 pieces to leave a safety factor in service. This plan resulted in lighter regrinds because cutting edges were not too worn nor burned by this time.

One of the last operations on the rollers was grinding to a 0.001-in. tolerance. Instead of a tapered arbor, which was tried, the work was held on a split-collar arbor to prevent runout. All rollers were remounted on the lathe so the OD could be cut concentric with the ID (this was just before grinding) to prevent wheel loading and glazing. The last roller operation was polishing and blending on a speed lathe.



GATE ASSEMBLY is adjusted for shipping and installation. Assembly is made with leaf vertical to allow weight of chains to extend them full length (for tightening) and to allow balancing of whole unit

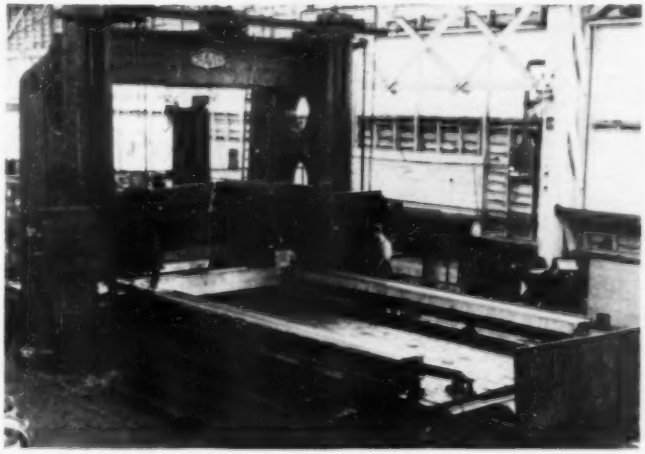


ROUGH PLANING OF TRACKS was done on Cleveland open-side machine. Hold-down pins were installed to clamp and straighten the two tracks. Cutting was done at 20-25 sfpm with a Mamax tool to 0.02-in. allowance for machining after assembly

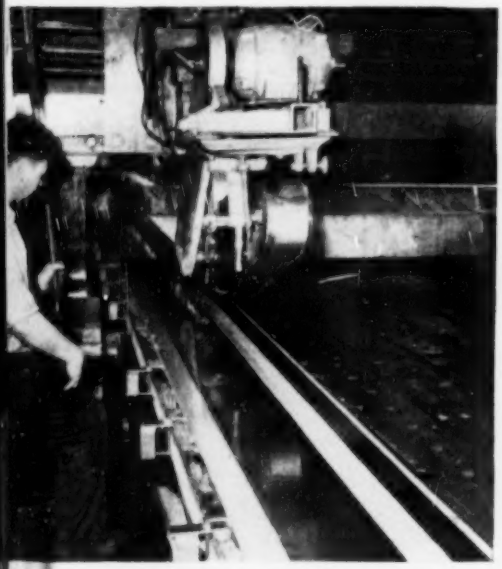
STEEL ROLLERS AND TRACKS

For the tracks, against which the rollers will rest after installation at the dam, one of the main problems was length. Full gate dimensions were 14½ ft wide, 27 ft high, and 3½ ft thick. (Total weight was 55 tons.) The tracks themselves were 25 ft, 10 in. long, 8 in. wide, and 3 in. thick. Therefore, all machining was done on planer beds.

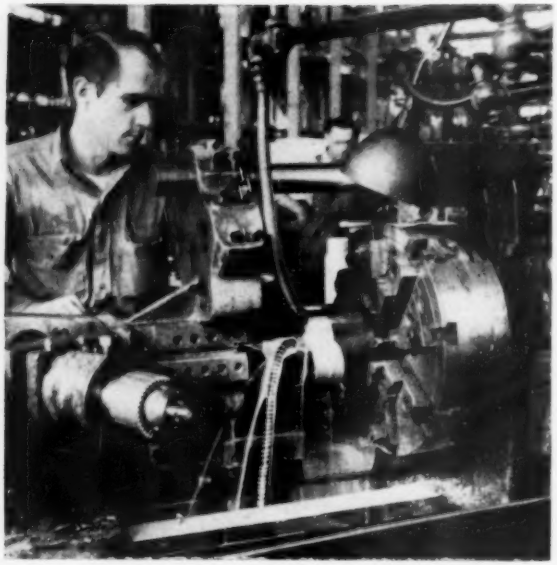
The hold-down strips and pins took care of warpage from heat-treatment. Although the regular planing operations were not anything unusual, the final grinding operations was troublesome. With the tracks bolted to the gate leaves, grinding had to be done with a 14-in. wheel at 1450 rpm. With the tracks mounted simply on the gate frame, an abrasive belt could be utilized, which in this case was cheaper and faster.



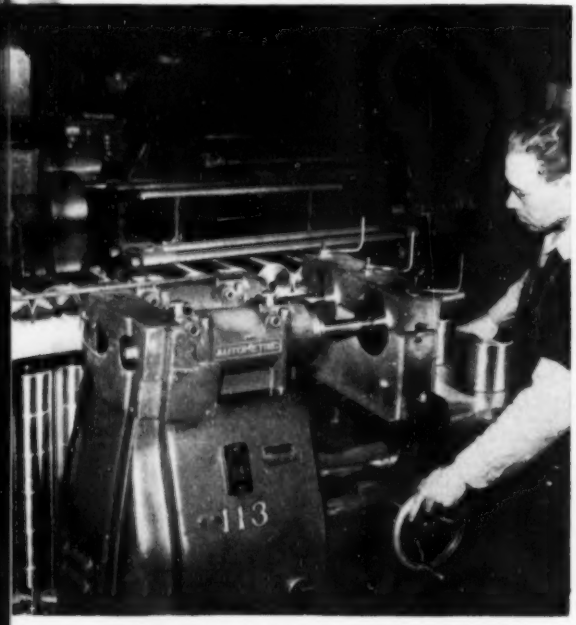
FINAL PLANING OF TRACKS was done on 32-ft Craven machine at 20 sfpm. Here the tracks were assembled to the gate frame by countersunk screws to permit passage of the tools



FINISH-GRINDING of tracks was done with silicon-carbide abrasive belt run by motor attached to planer head. Belt ran at 6000 fpm, table at 10 to 14 sfpm. Grit size was 36 to 50. Surface finish result of grinding was 16 mu-in

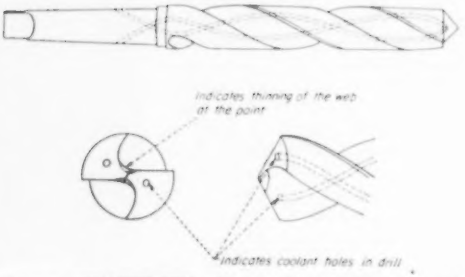


ROLLERS WERE TURNED and faced with carbides from 410 stainless at 290 Bhn. Central holes were drilled with thin-lipped drill equipped with two coolant passages that end near cutting tip. Drill was also skin-hardened



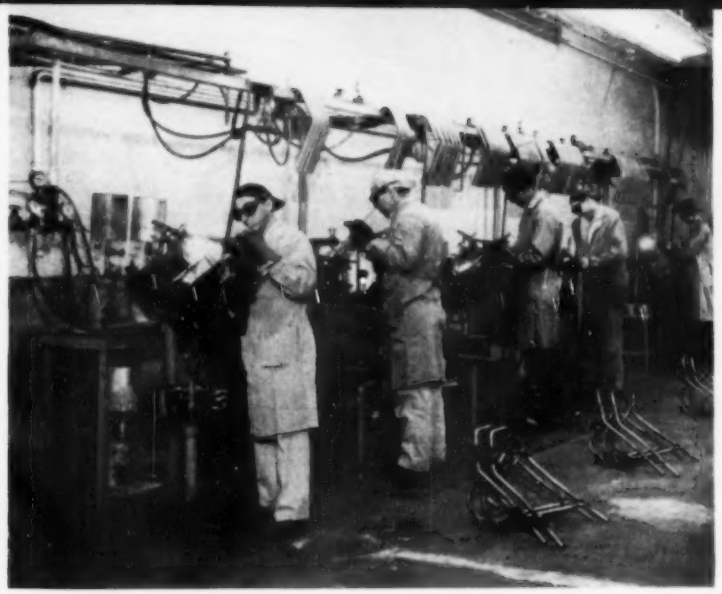
FINAL BORING took place on Autometric machine with twin heads. Fixture was wood blocks (to prevent scoring the rollers) with aluminum side plates (to align the work accurately)

FINISHED ROLLER



Sketch 1—**THIN-LIPPED DRILL** with two coolant passages was used to drill central holes of rollers

Flame-Fluxing Brazes High-Strength Assemblies



BRAZING LINE at McCulloch Motors is set up so flux, automatically mixed with acetylene, is supplied to the work by the flame. Flux is added to gas by unit on bench at first brazing station. One unit serves four torches, requires refilling (5 qt) about once every three days. Brass brazing by this method saves 2½¢ per handlebar for portable power chain saw

BY JOHN SHINN, LOS ANGELES

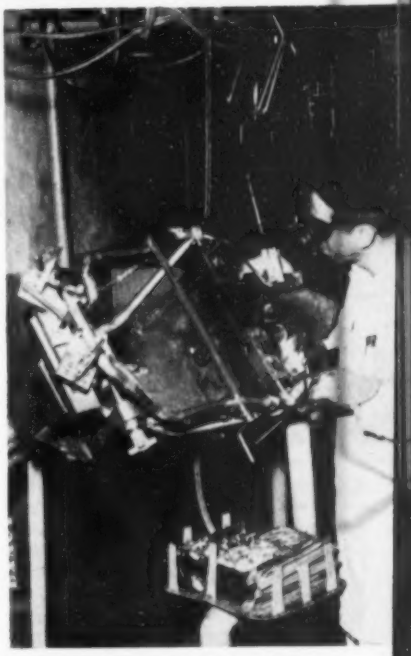
A year ago, McCulloch Motors Corp, Los Angeles, plagued with the near-impossibility of obtaining silver solder, decided to try a substitute of brass rod together with a fluxing process in which the flux is applied to the work by the flame. Like many another "temporary" expedient, this one has sold itself into permanent status.

Initially Engineering was doubtful of the strength of joints by the new method and was afraid of flux inclusions with the brass. Experience has satisfied on both counts. Used first only intermittently, the method has taken over completely at McCulloch except for induction brazing, where silver solder is still used.

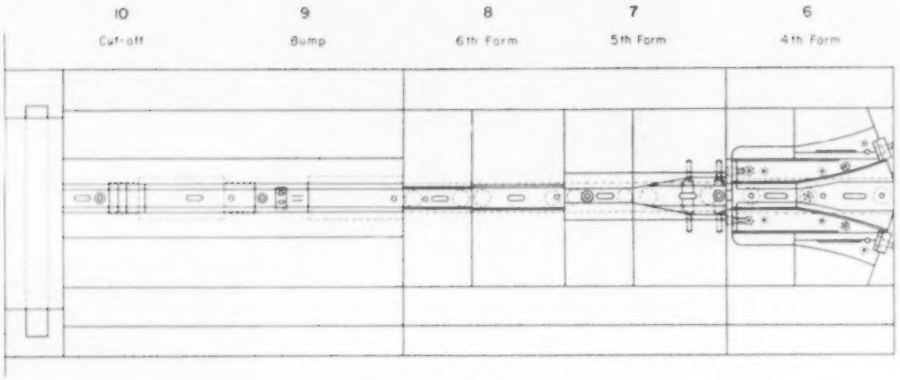
How the Process Works

Acetylene passes through a unit in which it picks up flux as a vapor. The flux travels with the gas to the torches. Its presence in the flame can be detected by green coloration. A regulating valve controls the amount of flux, which is fed from a tank above the unit. The flux, in liquid form, is specially made by the manufacturer of the equipment, the Gasflux Co, Mansfield, Ohio.

Using high-temperature brass rod is slower than using silver solder, but this is partially offset by the fact that no time is wasted fluxing the part or dipping rod in flux. Brass also fills gaps, such as occur when non-uniform tube ends are joined to other tubing, more easily than silver solder. No special cleaning is required. The flux comes off easily in a hot dip without scrubbing. Because of the lower cost of brass, McCulloch has found the new method to be 2½¢ cheaper per assembly than the old. In addition, operators are sold on the process.



BRAZING FIXTURE permits universal positioning for joining 10 different pieces that make up handlebar. Pieces are steel tubing plus copper-plated clips and crosspiece. Joints must be strong to stand heavy stress during use and must be smooth to take chrome plating. Parts supply is on arm



Grinding Fixture Aids Die Manufacture

EACH OF THE TEN STATIONS is made in its own dieset for simplicity of assembly and dismantling. Feed is 6.927 in.

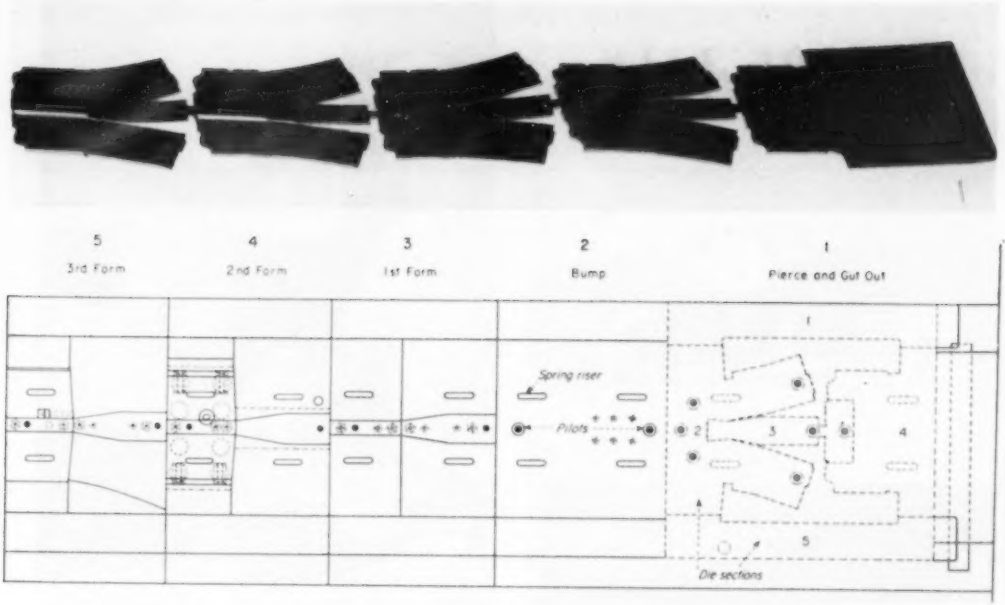
BY RUPERT LeGRAND, ASSOCIATE EDITOR

When the government required tools for a .30-cal magazine tube of greater capacity, late in the last war, it turned to the B Jahn Manufacturing Co, New Britain, Conn. This member of the National Tool & Die Mfrs Association has broad experience in making progressive dies for both large and small parts.

The magazine tube required several difficult forming operations, and radii had to be held on the punch and die sections. For these reasons, Jahn's designers decided to use sectional construction of the 10-station die (79¾ in. long by 22 in. wide) and to mill and grind the radii on the forming members with a master fixture. The fixture would insure interchangeability of die sections in two sets of tools, without any hand fitting, and also make it possible to supply interchangeable repair parts if necessary.

To produce the fixture, a pivot hole *A* was bored in a plate for a center about which a milling head or grinding head could be swung at the desired radius. For each die part, two dowel-pin holes were bored in the plate. These two holes bear the same relationship to *A* as the coordinates of the dowel-pin holes in the piece had with respect to the center for the forming radii.

MAGAZINE TUBE COMES from dies as at left. In second operation, the hook seam is flattened and the flanges are projection welded



Thus, if a die section with two jig-ground holes *D* was set up on the plate, the radii could be ground with positive assurance of making a part within precision tolerances; that is, within ± 0.0005 in.

The dowel holes for each die section were numbered on the plate, so that there would be no confusion as to which holes were to be used when fastening the part.

Die Stations

No. 1—Pierce and gut out. Objective of operation: to provide pilot holes and get rid of stock not needed in folding up the piece.

No. 2—Pilot from two center holes and put in welding projections. Four spring risers lift the ribbon so that it will feed over the subsequent forming stations.

No. 3—Form a central, partially tapered rib with sharp corners at the junction with body of part. The radius of the rib had to be developed.

No. 4—Bend flanges at 90° for welding, one down and one up. Bump a nib on one side to catch on the gun. This is done with an elliptical punch. One-half of the bump is pushed back in a later operation (lancing) to produce a sharp edge at right angles to magazine tube.

No. 5—Bend ears at 45° angle and lance the side nib and push one half back into the piece.

No. 6—Form beads in side walls of tube for strengthening purposes. Form up side walls, form over the ends at a radius.

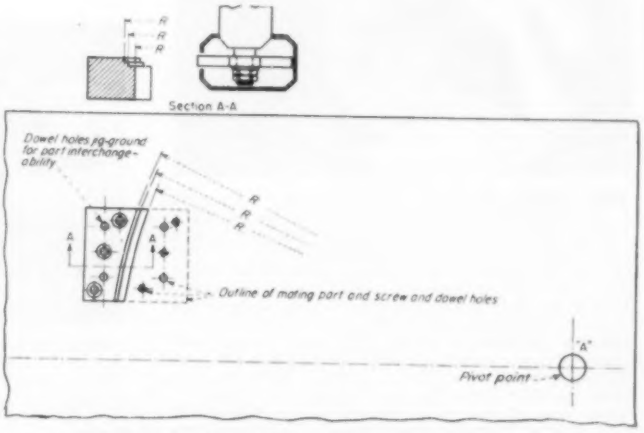
No. 7—Turn up flanges and restrike radius of center section.

No. 8—Hit radius at center section and form up side members to included angle of 30°, approximately.

No. 9—Bump two bottom projections.

No. 10—Lance nibs and cut off.

In a second operation, the assembly is closed and projection welded along the flanges.

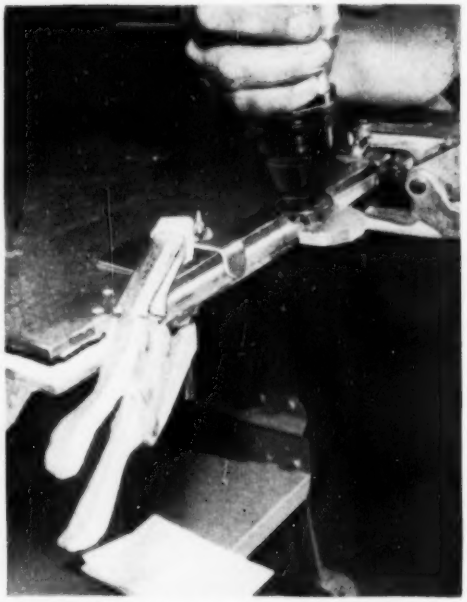


DOWEL HOLES as at *D* are jig bored in the master fixture plate in relation to pivot hole *A*, so that forming radii on die part can be ground to ± 0.0005 in.

TOOL TALK

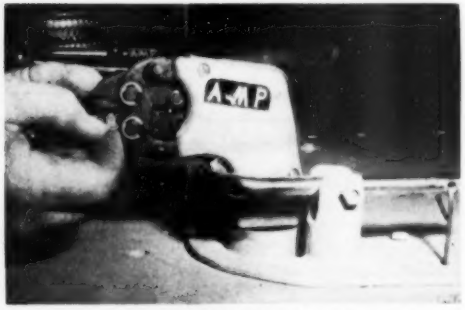
FROM

TEMCO AIRCRAFT CORPORATION



THREE HINGED JIGS and a hand-router are being used to trim tooling tabs from aircraft skin sections, in place of hand shearing or bandsawing formerly used. Each jig consists of two fiber strips, hinged together so that one fits flat on each side of a stack of sheets, and faced with felt to prevent damage to sheet surface. One fiber strip is a router guide; has a metal edge to minimize wear. One jig has a straight edge, one is convex, and the third is concave—to permit trimming straight and curved edges. Adjustable stops assure accurate positioning and positioning-pins inserted in the tooling-pin holes maintain alignment until the jigs are clamped in place. Two to ten skins, depending upon their thickness, can be trimmed simultaneously. Trimming time is cut in half and surface damage is practically zero. *M H Guy, Dallas, Texas*

ALLIGATOR-JAW ATTACHMENT is used as an accessory on pneumatic riveters; has speeded the riveting of light metals and small parts and greatly reduced rejections. With it, otherwise inaccessible places are readily reached. This device squeezes rivets in hard-to-reach areas of trim tabs, an operation formerly requiring a rivet gun and bucking bar. As tab skin is very thin, rivet guns frequently caused buckling and subsequent rejection. Consisting of two taper jaws joined by a pivot, this attachment fits into the holes provided in the plunger and anvil of the riveter yoke, for the top and bottom rivet-sets. A rubber cushion between the jaws separates them until the machine is energized, shooting a rivet. *B H Davis, Waxahachie, Texas*



PNEUMATIC HAND LUGGING TOOL gives double service by table mounting it and triggering it with a foot treadle, thus freeing both of the operator's hands to manipulate wires, lugs, and bonding braids. Fitting the tool to the need of the sub-assembly shop, employees mounted the hand tool with a single clamp through the table. Triggering is accomplished with a chrome-steel bar connected by cable to the treadle

Employee suggestions are the anti-friction bearings that keep every production program rolling smoothly . . . They are also the tumbling barrel that takes the burrs off basically good tool design . . . Here, to teach by example, are some operation-simplifying ideas—with credit to the originator

CONTROL-CABLE PULL TESTS are done on the threads of the terminals by a turnbuckle or the equivalent. Originally, the test was performed by threading each terminal into a turnbuckle which was then attached to the crosshead of a hydraulic cable testing machine. A clamp to replace the turnbuckle was made from a 9-in. length of 1¼-in. dia steel bar. At one end the clamp is cut down the center, with one side hinged for opening. A hole is drilled and tapped in the center of the divided opening. The threaded terminal is placed in these threads and the clamp is closed, then locked with a tight-fitting sleeve. This device saves 25 sec on each cable tested. *K W Goggans, Arlington, Texas*

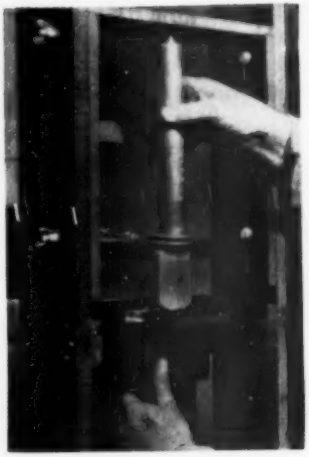
SPRING-LOADED STOPS having a diameter equal to the required spacing are installed on outer wing panel leading edge assembly jigs. Previously the skins were positioned by aligning their edges with marks on the jigs. This operation was time-consuming, but positioners which extended beyond the inner skins interfered with installation of the outer skins. Now, proper spacing is assured by the pin diameter, but when outer skins are later installed their weight pushes the stops out of the way. Thus, jig operation is speeded and rework resulting from improper spacing is eliminated. *J D Bragg, Grand Prairie, Texas*

ADAPTERS made from short lengths of threaded ¼-in.-dia drillrod permit the use of female piloted countersink cutters previously obsolete. Several hundred cutters were in stock but were not usable with the available female countersink stops. Cutter demand was greater than supply, and shipments of new cutters were irregular. A 1-in. length of ¼-in.-dia drill rod, having SAE threads and a hole drilled in each end to facilitate removal, was used to adapt the female cutters to the female stops. *S D Morrison, Dallas, Texas*

INDUCTION BRAZING CAN BE USED FOR COPPER AND COPPER-ALLOY PARTS

Contrary to general opinion, induction heating may be best — or the only practical — method for assembling copper parts. Here are examples and conditions governing its application

BY E M LAUGHNER, Manufacturing Engineer, Metals Joining Laboratory, Hq Mfg Engrg Dept, WESTINGHOUSE ELECTRIC CORPORATION



MICARTA FIXTURE for induction-soldering aluminum-bronze switch contact to copper switch arm (Example 12) has adjustable lower support on sliding platform, which is moved back to permit removal of finished assembly and insertion of next switch arm. Two-turn inductor is supported by crossbar in center of fixture. Upper support for switch-arm part is adjustable for arms up to 31 in. long

Copper and its alloys have high electrical and heat conductivity, so for years they have been considered poor materials to heat by induction methods. Generally, this is a correct conclusion, because the heat induced in a metal by a high-frequency induction coil is a direct result of the I^2R losses within the material. Even so, considerable cost savings often can be achieved by using induction methods when brazing copper assemblies.

Other advantages which can be gained include:

1. Higher quality of finished assemblies.

2. Often heat-treated parts can be brazed without excessive overall annealing. Usually this cannot be achieved with other heating methods.

3. Automatically controlled induction methods reduce losses from variations under control of the operator.

In the accompanying table are a dozen examples of copper assemblies now being induction-brazed or soldered in a number of Westinghouse departments. In every case, the induction method has shown an important increase in production rate. And in three of the listed examples, the induction method permitted production of satisfactory joints where previously used methods were not satisfactory.

In Assembly 1 (see table), the heavy copper trip coil for a large circuit breaker has melamine insulation between turns. Torch brazing of the joints between coil and terminals resulted in charring of the insulation. Induction heating not only prevented charring of the insulation and excessive annealing of the coil turns, but also resulted in a time reduction of 50% per unit brazed. For brazing this coil, a 20-kw, 450-kc rf generator is used at present. Activity has increased to the point where higher production capacity is needed, so a turntable fixture with a 10,000-cycle motor-generator set is being installed to increase the production rate to 50 parts per hour.

In addition to the time savings of 32 hr per armature indicated in Assembly 8, product quality is improved materially. With the previously used resistance-brazing method for joining armature coil leads to commutator necks, it was necessary to bend the necks to allow insertion of the brazing tongs. This frequently led to damaged commutators. Bending of the necks is eliminated by induction heating.

Assembly 3 is a Cupaloy stud to which a copper-tungsten contact is brazed at each end. In service this assembly receives high-impact shock loads, so it is necessary that the center of the stud have a minimum hardness of 50 R_c. Heat-treated copper alloy studs have an average hardness of 68R_B when received; after induction brazing, center hardness is 62R_B, well above the specified hardness. This is accomplished without any chilling system, as was necessary with the former gas brazing method which did not consistently provide the required minimum hardness.

For Assembly 3, the heating coil consists of two turns attached to a 450-kc rf transformer, effecting high heat concentration at the brazing area.

Induction heating lends itself readily to the soft (low-temperature) soldering of copper. Problems of high surface heating from skin effect are minimized because of rapid heat conduction from the

COPPER ASSEMBLIES INDUCTION-BRAZED WITH COST SAVINGS

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	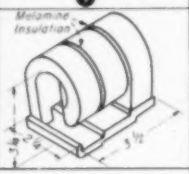		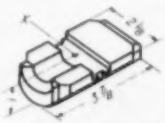	
ASSEMBLY	Circuit-breaker coil and terminal	Contact assembly copper to silver elkonite	Heat-treated copper-alloy stud to copper-tungsten contact	Contact assembly copper to silver elkonite
SIZE OR WEIGHT	6 lb	15 lb	3 lb	3 oz
HEATING TIME PER PC (FORMER METHOD)	Torch braze (not satisfactory)	Resistance Braze, 4 min.	Gas Braze (Not Satisfactory)	Resistance braze, 20 sec
HEATING TIME PER PC (INDUCTION)	2 min. @ 450 kc	1.5 min. @ 450 kc	3 min. @ 450 kc	8 sec @ 450 kc
% PROD. INCREASE	250%	200%	None	200%
REMARKS	Elimination of charring of melamine insulation by induction method	Irregular configuration of part not entirely suitable for resistance brazing	Hardness maintained well above required minimum of 50 R_c at point "X"	Contact held in position by field of high-rf current coil and annealing reduced at point "X"

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	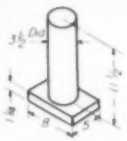	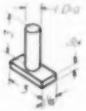		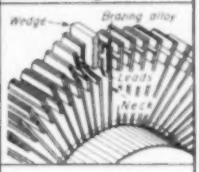
ASSEMBLY	Copper-stud assembly	Copper-stud assembly	Terminal	Armature coil to commutator bars
SIZE OR WEIGHT	30 lb	1 lb	2/load, 1 lb	2500-hp diesel gen.
HEATING TIME PER PC (FORMER METHOD)	Gas braze, 10 min.	Gas braze, 3 min.	None	Resistance braze, 36 hr
HEATING TIME PER PC (INDUCTION)	4 min. @ 10,000 Cycles	1 min. @ 10,000 Cycles	15 sec	4 hr
% PROD. INCREASE	250%	150%	None	400%
REMARKS	Higher-quality product. Cleaning time cut because flux is not destroyed by impinging gas flames	Same as #5	Minimize annealing in bend area	Higher-quality product by eliminating deformation of necks in previous method

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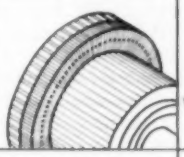
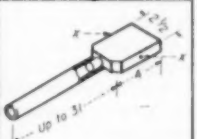
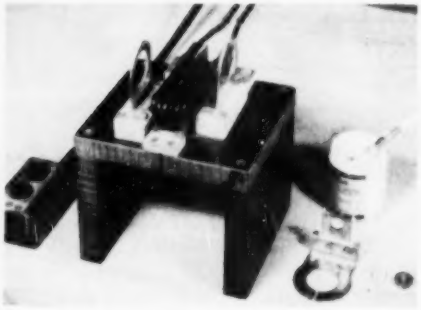
				
ASSEMBLY	Silver-elkonite contact to copper terminal	Beryllium copper to 1/32 X 1 X 1¼ in. silver contact	Commutator necks to armature leads	Aluminum-bronze switch contact and copper switch arm
SIZE OR WEIGHT	4/Load, 2 lb	8 oz	72 in. Circumference	3 lb
HEATING TIME PER PC (FORMER METHOD)	Res Br, 3 min.	None	Pot soldering if activity is high enough	4 min. (Not satisfactory)
HEATING TIME PER PC (INDUCTION)	40 sec	1 min.	55 min. @ 450 kc	2 min. @ 450 kc
% PROD. INCREASE	300%	None	None	None
REMARKS		No annealing at point "X"	Rapid soldering where pot is not economical. Excellent for repairs	Elimination of surface defects on surfaces marked "X"



COPPER TERMINALS (Example 7) are soldered two at a time in this simple setup at a 450-kc rf generator. Soft-solder ring is placed between terminal and 13/16-in.-dia nut, then assembly is mounted on insulating block and positioned against end of induction coil. Heating is rapid (15 sec) to minimize annealing of terminal

outer surface of the copper to the inner mass. This permits the use of very high current densities in the part being heated.

Example 11 shows the application of soft soldering of a diesel traction-motor commutator to armature-coil leads. The 72-in.-dia commutator in this example is completely soldered in less than 1 hr with induction heating. A single-turn inverted L-shaped hairpin coil is used with a 14-to-1 ratio 450-kc rf transformer to provide the high current density needed to overcome the high rate of heat dissipation in the relatively large commutator-bar segment.

No Pot Required

This application is of particular interest for repair and maintenance shops where production activity does not warrant use of a large and costly solder pot. With induction-heating equipment, several hours of armature preheating is eliminated, there is no need to wait while a solder pot is being brought up to temperature, and it is possible to remove and replace individual armature coils speedily.

Joining of an aluminum-bronze switch contact with a copper switch arm is illustrated in Example 12. Here, the pure tin contact surface, which is only ¾-in. from the solder joint, must not be affected in any way. Resistance heating had been used before induction heating was tried, but quality was low. Using a two-turn induction coil connected to a 450-kc rf transformer to concentrate the heat in the area to be soldered, induction soldering of this joint resulted in a time saving of 2 min. per assembly, and no further trouble was experienced with deterioration of the tin contact surface.

Some of the examples shown may be considered special cases, where reduction of annealing by localized heating, or where brazing or soldering could not be accomplished by any other method satisfactorily. But there are other examples of low-activity jobs that can be set up for induction heating quickly.

Consider the 30-lb copper stud assembly shown in Example 5—the fastest hand-torch gas-brazing method will braze this assembly in 10 min. It can be induction brazed in 4 min. with a motor-generator set to provide 40 kw at 10,000 cycles. If activity warranted, a special gas-heated turntable brazing fixture naturally would be employed for brazing this assembly.

Copper assemblies weighing up to 86 lb have been brazed at 1400 F in 6 min. with motor-generator frequencies. Results obtained with low-frequency motor-generator equipment have been impressive enough for engineers to change motor designs to permit fabrication with induction methods. One example is the induction brazing of copper-alloy damper rings up to 38-in. dia to the damper bars of squirrel-cage induction motor rotors.

When considering use of the induction method for brazing copper assemblies, very careful comparisons must be made with other methods of heating. Heating frequencies available, size of the parts, and coil design are the most important considerations.

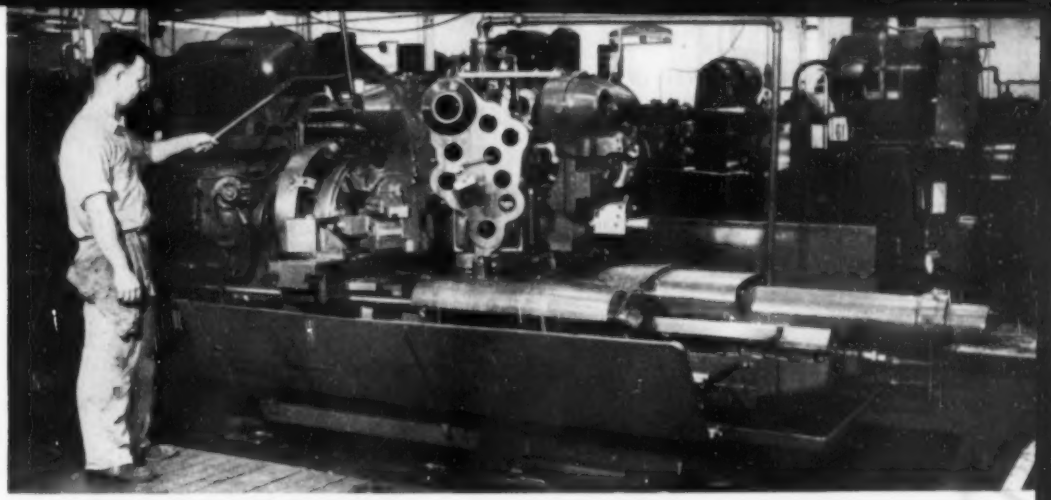
The limiting factor in the use of electronic heating equipment is design of the induction coil. When heating copper, whose permeability is the same as air, relatively high kva demand is made on the rf generator through using the greater number of ampere turns around the work as possible. So the inductor voltage rises as the number of turns in the inductor increases, with rf equipment, coil insulation and machine-component voltage ratings are the factors determining coil length.

In coils for rf frequencies, electrical insulation must be the best, coils should be made from flattened tubing to make possible more turns per inch of coil length, and the inner face of the coil turns should be lined with copper strips to prevent destruction from cooling-water leakage if the coil accidentally is touched by the workpiece. The inductor used for brazing the copper trip coil of Assembly 1 has been used for several thousand units.

Multiple-Unit Brazing

When brazing small items, such as the contact assembly in Example 9, faster heating will result by brazing four units simultaneously, rather than singly, as better machine loading is provided. Other means for reducing rf voltage around the workpiece is by using rf current transformers where possible. For example, in brazing Assembly 4, use of a single-turn, high-current inductor provides fast heating, and the high flux density in the coil positions the silver contact correctly with the copper-alloy terminal. Where copper parts are thin, magnetic material often can be placed against the assembly to provide better machine loading and consequent faster heating, as in Assembly 8.

Consider first the practicability and savings that can be realized when using induction-heating methods for brazing copper parts of proper design—and consider last the bogey of the relatively low efficiency of heating copper inductively as compared to magnetic materials, such as steel.



CURTISS-WRIGHT *boosts output with* MACHINABILITY DATA

BY RUPERT LEGRAND, ASSOCIATE EDITOR

Startling savings in new machines, in manhours and the cost of cutting tools, and in floorspace have been achieved by the Curtiss-Wright Corporation by applying the machinability data it developed for the United States Air Force. The Wood-Ridge, N J concern has already published two books on this subject. See *American Machinist* Special Reports Nov 27 '50, Dec 25 '50 and Oct 1 '51 for condensations.

To date, at its Wright Aeronautical Division, Curtiss-Wright has applied machinability techniques to a variety of different parts and alloys. Experience has demonstrated that the average cutting cycle can be reduced by as much as 60%, by conversion from HSS to carbide.

The applications cited herewith relate to the forged cylinder barrel and crankcase sections—both of hardended and tempered steel—for compound piston engines. In these two departments the over-all cost savings amount to 33%. Machine savings total $441,000. Labor and tool savings add another $82,000 per year.

Although a comprehensive machinability program would require new equipment at many points, these advances have resulted from tooling up *existing* machines with the tool materials best suited to the nature of the operation, and running the machines at the nearest available speed and feed to the optimums established by the machinability studies. Compromises are often necessary. And to save at least a year in starting the program, the original tooling stations were left on the machines. Thus, despite machine and toolholder limitations, a great deal has been done to get more out of existing equipment at less cost.

Although most (but not all) of the tools now used are carbide, the tool material has been selected on the basis of what it must do. With carbide, it is considered best to generate, not form or plunge cut. In addition, closer control of size is obtained on roughing operations (approx 0.002-0.003 in. is typical in aircraft practice). On finishing operations the surface finish produced with carbide tooling is such that final polishing operations are much easier than before. A high-quality finish is essential on this class of work to remove stress concentration points or tool marks.

Machinability and tool-replacement studies are being carried forward for Curtiss-Wright by Metcut Research Associates, Cincinnati, Ohio. They have also revealed great savings on forged aluminum cylinder heads and on forged steel gears.

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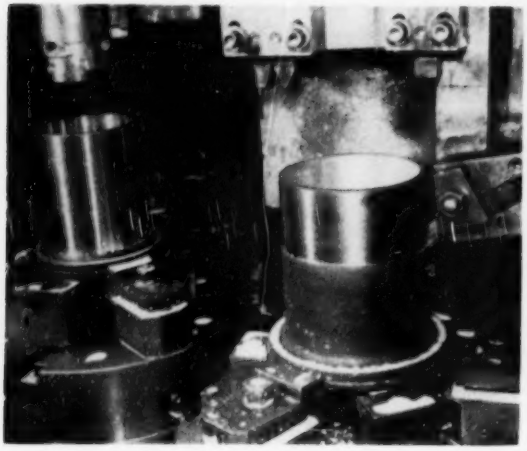
CYLINDER BARRELS TURNED IN ½ THE FORMER TIME



Operation 20—By selecting carbide to suit metal's microstructure and by tool redesign, 1/3 as many tools are now consumed on finish turning

Operation 30—By changing from HSS to carbide, the floor-to-floor time has been cut 50%. Insert toolholders minimize tool-changing time

Some of the most spectacular savings in machining of the steel cylinder barrel are realized on the first two operations. These are performed on Bullards. By cutting the machining time in half on the second operation (No. 30), it has not been necessary to add equipment to cope with schedules. Carbide tooling permits the job to be handled with one machine and two operators, whereas HSS tooling would require two machines and four operators.

Examination of the heat-treated and tempered cylinder-barrel forgings revealed that they have a tempered martensite structure similar to that illustrated later on for crankcase sections. Material is modified G-grade Nitralloy, and the hardness is 241-285 Brinell. Actually, the forgings average 265 Brinell, and the martensitic structure contains more, abrasive constituents than the pearlitic structure of normalized alloy forgings of the same hardness. From machinability studies it is known that a general-purpose, steel-cutting grade of carbide assures good tool life and high metal-removal rates when rough machining or turning with interrupted cuts on steels having such structure. The next harder grade of carbide is used for the finishing operations.

For the first operation (No. 20), the forging is rough bored and the OD between flange and cylinder-head end is rough turned on an 8-spindle Bullard. Carbide tools are used on the last station. By redesigning the tools on the last station and changing the grade of carbide, tool savings of $9000 per year were effected.

COMPARATIVE SPEEDS AND FEEDS

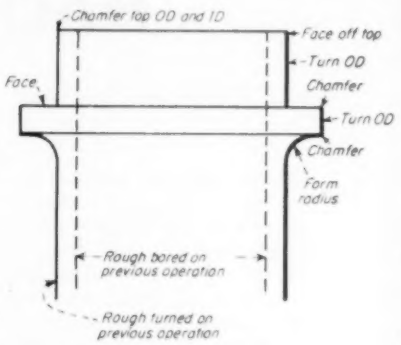
OPERATION 30

	HSS			Carbide		
Sta.	Rpm	Ipr	Min.	Rpm	Ipr	Min.
1	24	.0254	2.9	137	.0187	1.00
2	24	.011	3.07	155	.0124	1.10
3	24	.0153	3.73	137	.0124	0.80
4	26	.0095	2.88	137	.011	0.80
5	26	.0093	3.24	155	.011	1.00
6	Unloaded and load					

Here is the way tool savings break down on Operation 20:

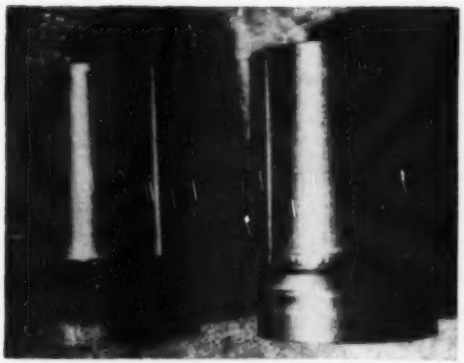
	Original Carbide	Changed Carbides and Design
Cost	Same	Same
Pcs per grind	5	25
No. regrinds	10	10
Tools required		1/5th
Tool cost		20%
Regrind cost		20%
Yearly cost		20%

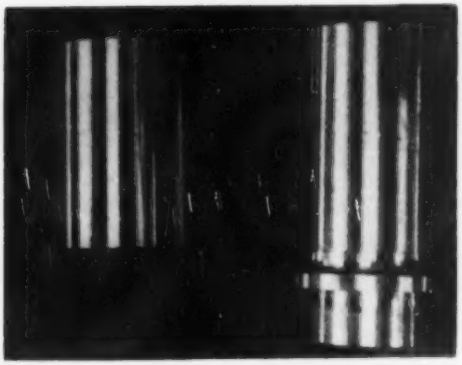
The really spectacular savings were obtained on the second operation (No. 30). Here the flange and skirt are machined on a 6-station Bullard. This machine had been tooled with HSS and was a bottleneck. Tool blocks were redesigned to accommodate carbide tools. Speeds were increased and feeds were adjusted on each station of the machine. One of the tools designed can be used at five different positions in the setup, thereby eliminating multiple tool numbers, designs and stock problems.



The reduction in floor-to-floor time amounts to nearly 50%, as compared with HSS tools. The cycle time was 6.1 min., with carbides it now is 3.2 min. Production in an 8-hr shift rose 90%. There was no need to keep two machines busy, and one was released.

Machining time is now reduced below the handling time. With a conveyor system for handling pieces to and from the operator, the cycle time could be reduced another 30%.





Comparative Finishes—Tool marks are much more obvious on cylinder barrels rough machined on the old setups as compared with barrels produced exclusively with carbide tooling of the correct grade. The improved finish aids subsequent chucking

Here are the savings:

One 6-spindle Bullard	$41,500
Two operators	8,000
Tool savings	1,350
Total	$50,850

A detailed analysis of the work performed at Operation 30 will show how carbide tooling can be used effectively:

Station 1—Turn the OD and rough face the top. One toolholder uses an insert tool of triangular cross-section. This tool provides for indexing three times, and then three times more after turning end for end. Thus, six cutting edges are available before regrinding. Another reason for selecting an insert toolholder is the strength and backing supplied, so that a chip breaker can be ground in the tool itself. Standard brazed tools were not successful, because limitations on tool design prevented adequate support for the chip breaker. The top is faced with a standard tool to provide uniform stock for the second operation.

Station 2—A triangular-insert tool faces the top of the flange, and a conventional brazed tool finishes the top.

Station 3—A triangular-insert tool rough turns the OD of the flange.

Station 4—Form radius under the flange. Two chamfering tools chamfer the top and bottom of the flange.

Station 5—Three standard tools: one finishes the flange OD; a second, the top of flange, and a third chamfers the ID of the top.

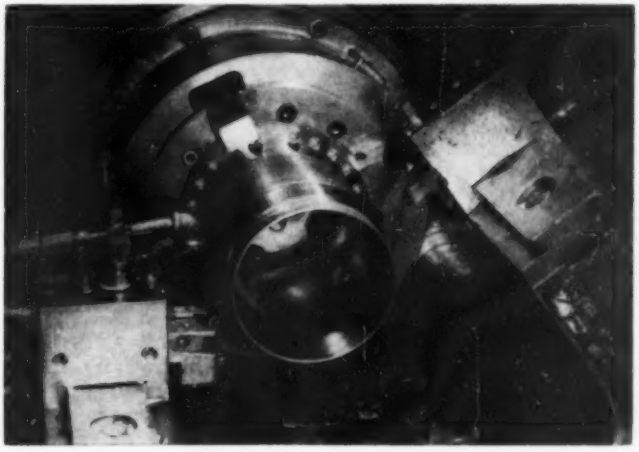
Station 6—Load and unload.

Thus, on Operation 30, the number of tools has been reduced from 16 HSS tools to 11 carbide ones.

After the barrels are nitrided, they are returned. A new fixture allows both ends of the barrel to be done simultaneously, instead of in separate operations. The purpose is to reduce the cycle time on the returning operation to a value consistent with the roughing cycle, in order to maintain balanced production.

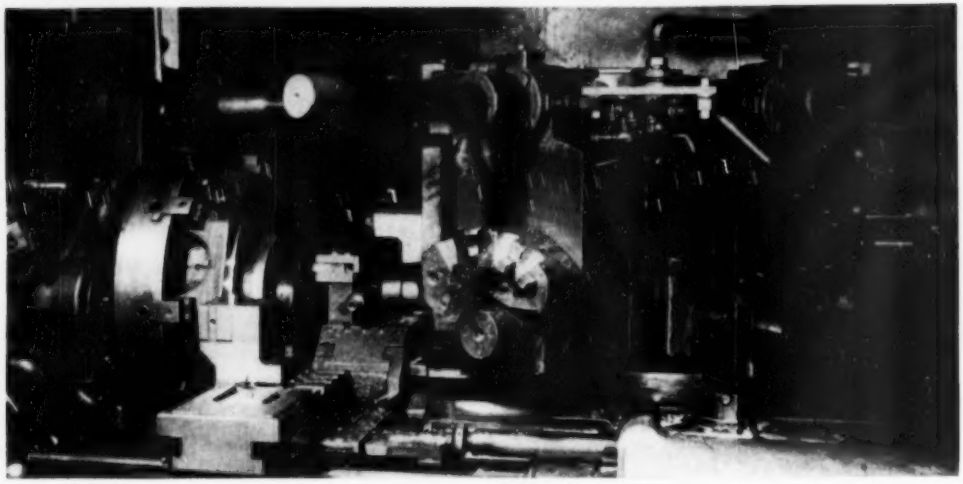
Carbide tools will also eliminate a polishing operation. Milling stud clearances in the flange was done with HSS ball cutters. But with a 2-head machine and the proper grind, carbide cutters are expected to produce such an excellent finish that there will be no significant tool marks to act as stress concentration points. Hence 11 men saved on hand polishing.

Knowledge of microstructure *vs.* machinability also brought about a considerable increase in number of piece per grind on Operation 380. Here the upper end of the barrel is turned for a thread fit. General-purpose steel grade of carbide had been used. Production amounted to 8 to 10 pcs per grind. By changing to a hard grade of carbide suitable for the tempered-martensite steel, the output per grind was boosted to 35 pcs. Labor savings amount to 60%, and tools costs about the same.



Operation 380—By changing to a harder steel-cutting carbide, tool life was increased from 10 to 35 pcs per grind

FRONT-ENGINE CRANKCASE SECTION MACHINED IN 1/3 FORMER TIME



Operation 30—Station 2, foreground, has three HSS tools to sweep a 2-in. wide swath. Station 3 (backed away from cut) machines a concentric swath. These two operations leave 0.125 in. of stock for finishing

By changing to carbide tooling, the front engine section is now machined in 123.9 min. total time, as compared with 371.5 min. for HSS tooling. The time saving amounts to two-thirds. Tools are tipped with Carboloy 78 B cemented carbide or equivalent general-purpose grade for cutting steel. On finishing operations 80 and 90, a harder grade of carbide similar to Carboloy 78 is used. Material is AMS 6342 B, which is equivalent to SAE 9840. Forgings are heat treated to a tempered martensite.

Details of significant operations are:

Operation 25—This was an "emergency" operation installed to convert a stock of old forgings to ones suitable for a different engine. Some 6 lb of metal was removed. With original HSS setup, cutting time was 63 min. This was done on the first three stations of Op 30. By setting up "emergency" Op 25, using carbide tooling, the time was cut to 17 min. Using the converted forging, regular Op 30 (carbide) takes 34 min. With new forgings, Op 25 was eliminated. Operation 30:

Station 1—Rough bore and face with carbide tools.

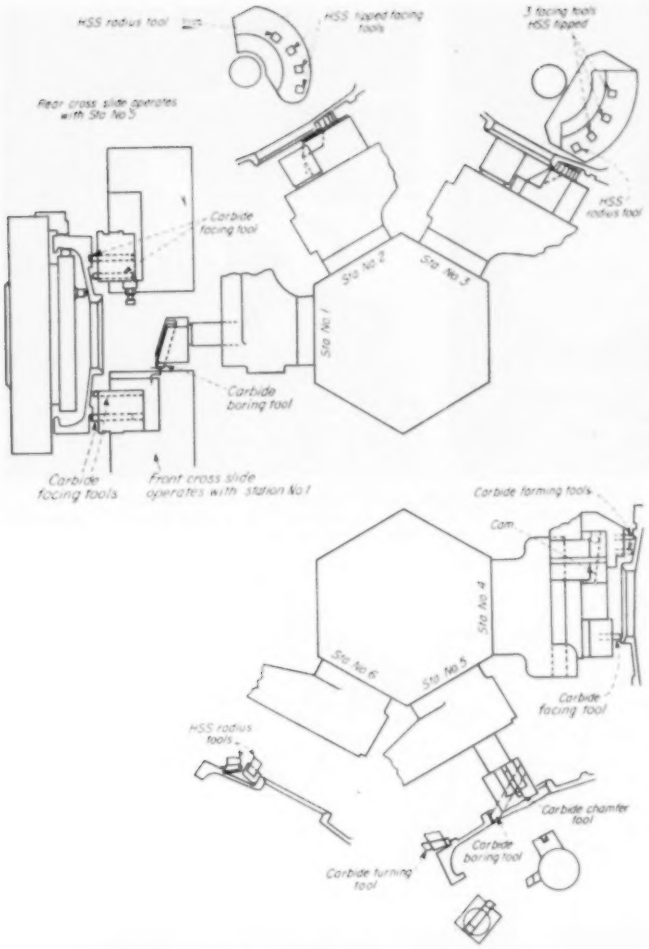
Station 2—Plunge cut to rough out inner half of web and radius.

Station 3—Plunge cut to rough

FRONT ENGINE SECTION . . . Reduction in Cutting Times With Carbide Tooling

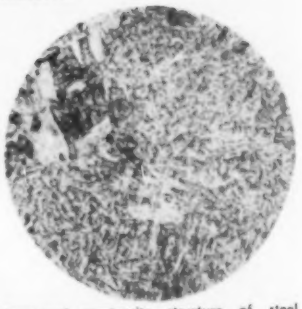
		HSS TOOLS						CARBIDE TOOLS					
OPER NO.	Sta No	No of Tools	Rpm	Fpm	Ipr	Min	Sta No	No of Tools	Rpm	Fpm	Ipr	Min
							1	2	105	180	.006	4.4
							2	1	105	200	.006	4.3
25							3	1	105	220	.006	3.9
							4	2	105	240	.007	4.5
							5	1	105	260	.016	.8
							6	—	—	—	—	—
												17.9
	1	4	9	15	.007	25	1	3	70	150-380	.009	4.7
	2	4	9	19	.008	28	2	4	9*	19	.020	6.5
30	3	4	9	37	.010	10.5	3	4	9*	37	.008	6.7
	4	6	9	24-50	.0065	63.0	4	3	70	180-330	.009	3.5
	5	3	20	21-45	.012	6.5	5	5	70	150-180	.010	4.3
	6	7	9	19-45	.007	15.0	6	2	9*	21-42	.009	8.0
	Tot	28				148.0		22				33.7
	1	5	9	15-50	.009	35	1	2	58	350	.014	3.8
	2	3	9	15-30	.007	30	2	1	58	140-275	.013	6.8
40	3	1	9	50	.020	10	3	1	58	275	.008	3.5
	4	1	9	30-50	.015	25	4	1	58	275	.015	5.2
	5	1	9	50	.010	16	5	1	58	275	.007	5.1
	6	2	20	15-50	.012	10	6	3	58	340	.016	2.7
	Tot	13				126		9				27.1
	1	2	17	93	.023	8	1	2	58	330	.007	3.6
	2	1	*58	140-290	.006	10.5	2	1	58	140-290	.020	7.2
80	3	1	17	90	.017	7.5	3	1	58	300	.004	3.4
	4	1	*58	385	.011	7.5	4	1	58	385	.017	6.4
	5	1	17	102	.010	13.5	5	1	58	350	.012	8.7
	6	3	17	37-88	.018	11.5	6	3	58	135-305	.007	2.8
	Tot	9				58.5		9				32.1
	1	4	17	37-105	.011	16.5	1	4	58	130-350	.011	4.2
	2	2	17	37-82	.015	15.5	2	2	58	130-280	.012	6.3
90	3	—	—	—	—	—	3	—	—	—	—	—
	4	—	—	—	—	—	4	—	—	—	—	—
	5	7	17	37-85	.020	7	5	6	58	130-390	.012	2.6
	6	—	—	—	—	—	6	—	—	—	—	—
	Tot	13				39.0		12				13.1

*HSS retained at these stations because of the nature of the cut.



Hub end of crankcase front section is rough machined on Fastermatic. Radius tools at Station 6 will be changed to carbide

Material



Tempered martensite structure of steel crankcase forgings, as received in machining department, is developed by normalizing, quenching and tempering. Material is AMS 6342 B, which is equivalent to SAE 9840. This structure is more difficult to machine than the pearlitic structure usually present in normalized alloy steels

out the outer half of the web and radius.

Note: Stations 2 and 3 retain HSS tools. Stock removal is about ⅛ in. and the tools sweep a circular swath about 2 in. wide.

Station 4—Finish face the hub and turn at the web. The carbide facing tools travel about 1½ in.

Station 5—Finish bore and chamfer, also finish turn the outer pilot OD.

Station 6—Finish the radii in the plunge-cut areas. Because of large radii, and necessity of blending the cuts, it was desirable to retain HSS tooling (2 tools). The time was cut down from 15 to 8 min. Carbide is being tried.

Despite interrupted cuts, the use of carbides on Operation 40 reduced the cutting time by 79%. The part is held so that the pads face outward. Yet despite the interrupted cuts so encountered, a general-purpose carbide proves satisfactory. Details of Operation 40 are:

Station 1—Rough the large ID and face the legs.

Station 2—The tool generates a straight path for about ½ in. and then follows a taper along the web of the crankcase section. This one tool replaces six plunge-cut tools, and produces a better finish. Formerly, this was the longest operation at 30 min., but it is now reduced 6.8 min.

Station 3—Face the back side of the pads.

Station 4—The tool rotates through a 2½ in. radius to blend with the cut produced in Station 2.

Station 5—A single tool generates a 2-in. path at a radius of 11.60 in., to blend with the radius produced in Station 4.

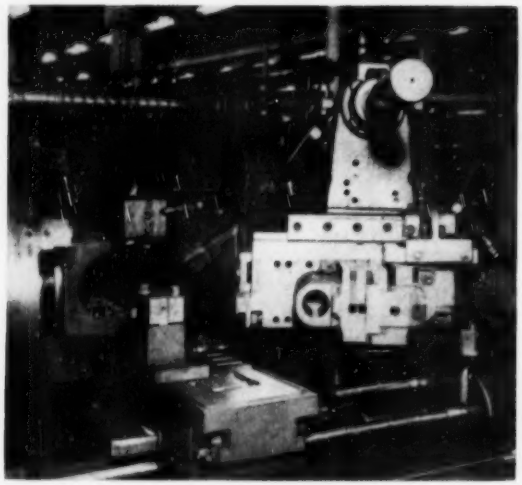
Station 6—Finish face the pads and bore the ID.

Nine tools are used, but it was necessary to provide heavier tool blocks and larger-section tools.

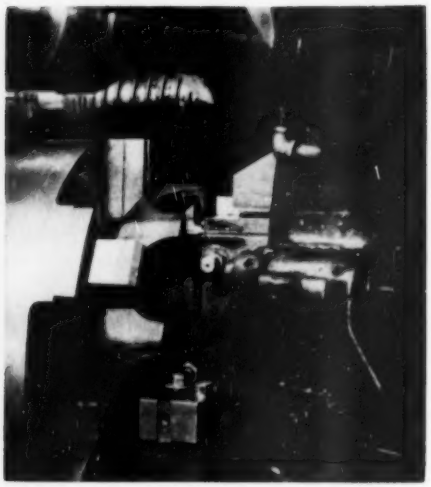
On Operation 90, a revision of the tool layout at the various stations accomplished better accuracy and greater ease of setting. For example, the tool for turning the OD of the pilot was originally set horizontal at Station 1 and in a rocker arrangement. These conditions made it difficult to set the tool to blueprint size. If the tool was not set properly, it was possible for the tool to dig into the face of the forging, producing an imperfect part.

Now, a different tool block is mounted at Station 3. Positioning of the tool in both the horizontal

(FOR OPERATION—TURN PAGE)



Operation 40—At Station 2, foreground, one carbide tool replaces 2 HSS plunge tools to generate a flat surface and taper. Station 3 (toward cut) faces the inside of the legs

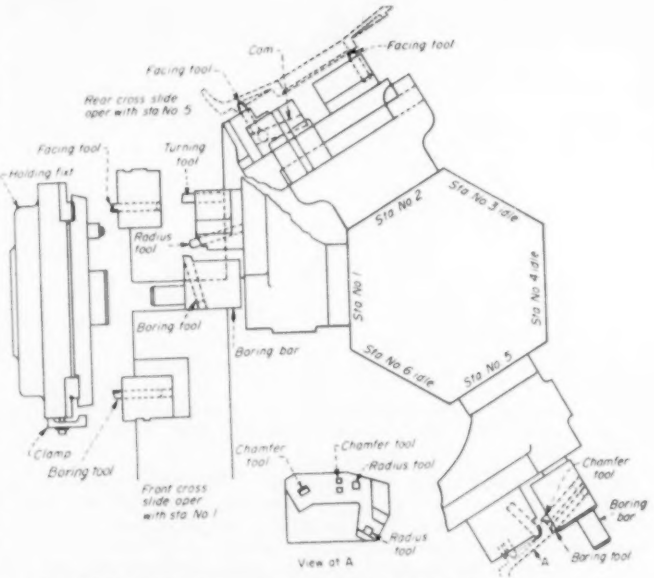


Radius tools—Station 4, foreground, generates 2½ in. radius and Station 3 in cut generates 11.06 in. radius to blend, requiring good cam design and tool setting

and vertical settings can be controlled very accurately. Essentially the device is a boring bar with a screw-type movable head that regulates the vertical position of the tool. Lateral position of the tool is set by adjusting the position of the boring bar and then the assembly is clamped. Of course, tool-setting gages are used.

It is never wise to accept any tool material as a panacea. Although carbides are the obvious choice for most of the operations involved in machining the barrel and the crankcase sections, there are cases where other tool materials have and still give better results. For the roughing operation of the rear crankcase section, for example, carbide works well on one of the large form cuts. On the finish operation, however, on this same part due to the design and section thickness of the crankcase section, the use of a HSS forming tool avoids chatter.

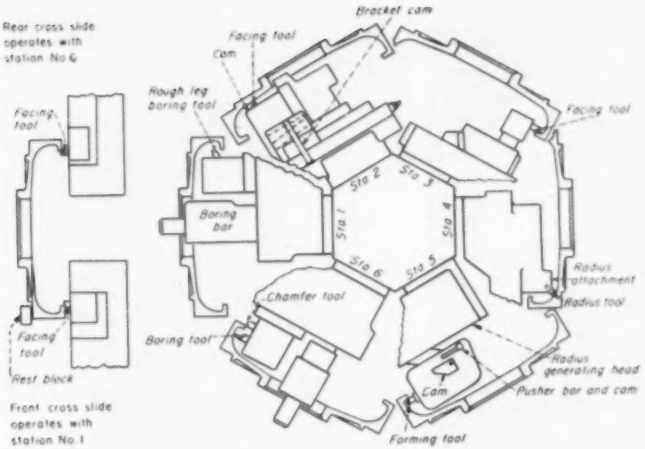
In finishing operations on the front main section of the crankcase, the cuts average about 1/16 in., whereas roughing cuts remove from ⅛ to ¼ in. of material. On operation 90, which accomplishes finish machining of the front of the part, diameters from 8 to 20 in. are machined. There is more than a 2:1 variance in cutting



Retooled for carbide—Operation 40 uses 9 tools instead of 13, cycle time is 27 min. instead of 126 min., and $69,000 in machine potential has been saved

speed, but satisfactory tool life is obtained. For example, at the outside edge, the cutting speed is 280 fpm, and at the bore it is 130 fpm.

The important reductions in cutting times cited for the front main section of the crankcase are the result of compromises. The Fastermatics installed provide speeds and feeds in several ranges (4 manually selected ranges, with 4 speeds automatically in each range), but it is not always possible to come close to ideal cutting conditions. Tooling stations had to be retained, because new ones would have re-

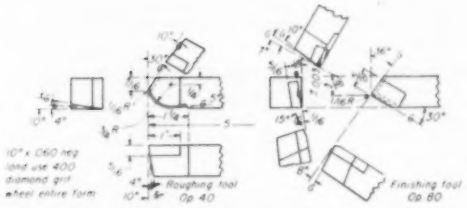


CYCLE TIME on Operation 90 for the main front crankcase section was cut two-thirds by using carbide tools. Machine potential has been increased about $50,000

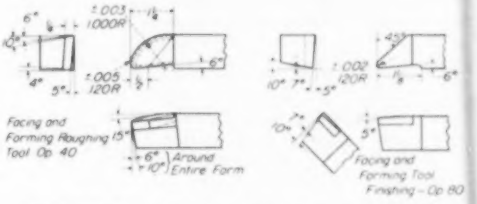
quired a year to procure. In other words, starting from the optimum feeds and speeds for carbides on a martensitic structure, it was necessary to work back to a set of conditions at each station that would accomplish the least possible cycle time without chatter.

The great gain in output per station is obtained by the higher feed rates possible with carbide tooling. Increasing spindle rpm increases feed rate proportionately, but feed per rev is kept constant. Feed per rev with carbide is approximately the same as it was with HSS.

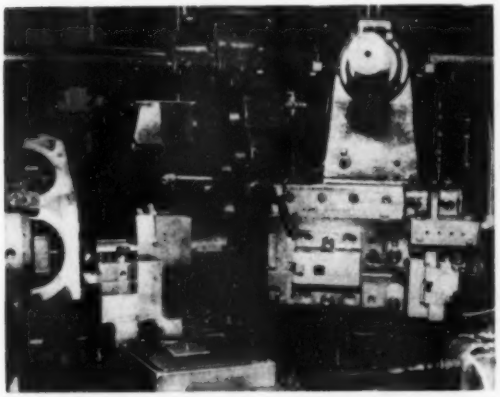
Chatter, of course, is highly undesirable with carbides. It occurs when these materials are tried on wide forming cuts. Since the cost of resharpening carbide form tools is high, some forming cuts are performed with Tantung tools, resulting in 50% increase in metal removal as compared with HSS.



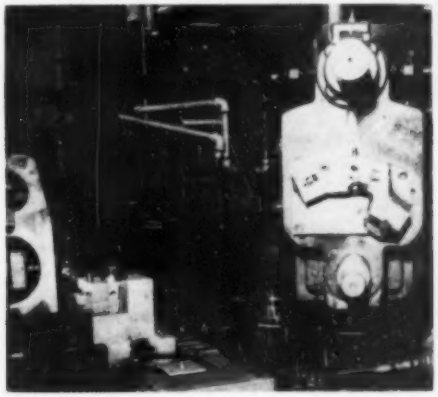
FACING AND FORMING tools for roughing, Op. 40, are made from standard toolbits and ground with 10° negative land along cutting edge. Finishing tools, Op. 80, have a 30° side cutting edge angle and a negative lip of 15°



ROUGHING TOOL on interrupted cut has a shear angle of 15° to 18° created by 15° negative back rake and 5° positive side rake. Standard finishing tool is ground with 5° negative back rake, to create 5° shear angle, which is sufficient for light cut

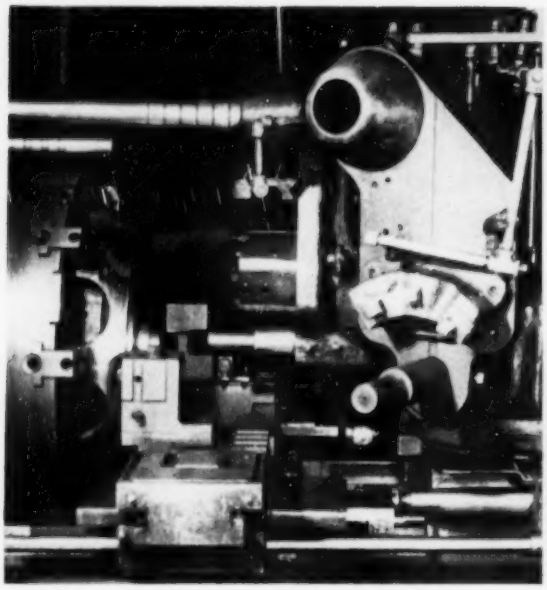


TWO TOOLS are used at Station 2, foreground, on Op. 90. Left-hand tool faces the hub, the right-hand tool generates a taper on a 3½ in. path

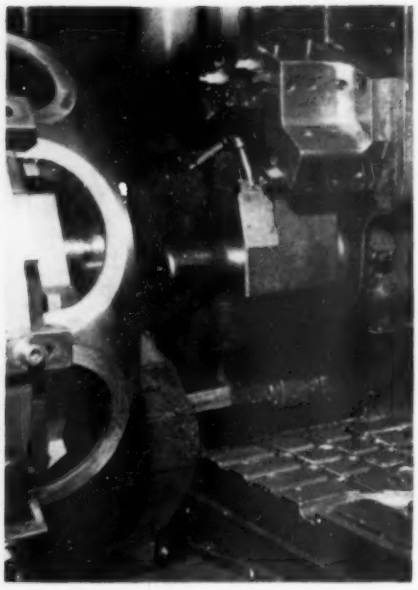


TWO RADIUS TOOLS at Station 5, Op. 90, finish form the pilot ID and hub OD, and two chamfering tools chamfer the edges of the pilot OD and ID

MAIN REAR SECTION



Carbide grooving tool, station 3, Op 90, on rear crankcase section, stands up well. Station has two Tantung-tipped plunging tools



Op 90, Sta. 5: 6 carbide tools finish bore and chamfer, finish the hub OD radius, finish groove, chamfer the pilot ID and OD

OPERATIONS on the main rear section, and the two center sections, have likewise been cut timewise. For example, consider certain stations at Operation 30.

Station 3—Plunge a groove with a carbide tool and plunge the remainder of the web section with Tantung-tipped tools. Initially this station was tooled with Tantung exclusively. However, at 95 fpm the grooving tool does a lot of work, and the upper limit for Tantung was being crowded. Hence the shift to carbide.

Station 4—One carbide tool finish generates the web section, using a taper attachment, and another faces off the hub.

Station 5—A spherical radius is cut on the OD. This starts out as a continuous cut about 1½ in. wide and then progresses to an interrupted cut of about the same width. To overcome severe tool conditions, a 10° negative rake is used. The tool is set very accurately for correct location of radius. The tool fits into a vertically slotted toolholder, of which the back is used for a reference to set the lateral position. The height is governed by a tool-setting gage.

MAIN REAR SECTION . . . Reduction in Cutting Times With Carbide Tooling

	HSS TOOLS						CARBIDE TOOLS					
OPER NO.	Sta	No. of Tools	Rpm	Fpm	Ipr	Min.	Sta	No. of Tools	Rpm	Fpm	Ipr	Min.
	1	2	20	40	.012	7.5	1	4	70	170-420	.010	3.8
	2	7	9	31	.012	24.0	2	3	20	68	.007	3.8
30	3	3	9	42	.005	22.5	3	3	20	95	.002	12.0
	4	3	20	47-86	.024	10.5	4	3	70	170-300	.012	3.7
	5	1	9	52	.010	21.5	5	3	70	405	.008	4.7
	6	7	20	42-115	.010	20.0	6	6	20	42-115	.009	7.0
	Tot	—				—		—				—
		23				106.0		22				35.0
	1	10	9	54	.020	23	1	4	58	340	.015	3.6
	2	4	9	26	.007	5	2	1	58	140-320	.015	7.0
40	3	1	9	50	.020	10	3	1	58	330	.007	8.4
	4	3	20	42-110	.018	12.5	4	1	17	54	.005	5.0
	5	1	9	52	.008	21.0	5	1	58	330	.007	8.4
	6	3	20	118	.012	10.5	6	3	58	330	.015	2.5
	Tot	22				82.0		11				32.2
	1	3	9	51	.025	12.0	1	2	58	330	.012	4.6
	2	1	70	145-395	.014	7.5	2	1	58	130-330	.015	7.3
80	3	1	9	49	.030	7.0	3	1	58	315	.013	2.7
	4	—	—	—	—	—	4	—	—	—	—	—
	5	1	9	52	.008	22.5	5	1	9	52	.020	15.0
	6	3	20	110	.020	7.0	6	3	58	325	.009	4.4
	Tot	9				56.0		8				34.0
	1	4	20	100	.014	9	1	4	58	285	.007	4.1
	2	2	20	42-112	.009	20.5	2	2	58	130-325	.009	5.6
90	3	—	—	—	—	—	—	—	—	—	—	—
	4	1	20	120	.025	12.0	4	1	58	350	.008	7.1
	5	9	20	44-96	.011	7.5	5	9	58	130-280	.009	3.4
	6	—	—	—	—	—	6	—	—	—	—	—
	Tot	16				49.0		16				20.2

Packard's Precision Job-Lot Tooling Makes High-Speed Diesels for the Navy

Featuring light-weight aluminum structure, interchangeability of major parts, easy starting, and high fuel economy, Packard's new Series 142 4-cycle diesels are made to as close tolerances as most aircraft engines. Production tools therefore must be of highest precision, yet of simple design to keep tooling costs in line with production requirements

By BEN C BROSHEER, Associate Editor

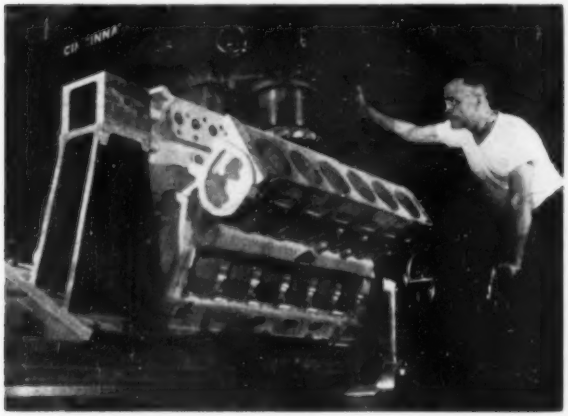
SERIES 142, 4-cycle, water-cooled, automotive type, high-speed diesel engines just announced by Packard Motor Car Co are currently in production for the US Navy in two marine models—a 6-cyl inline engine rated at 300 bhp, and a 600 bhp V-12. Both have turbosuperchargers and are designed for continuous duty at 2000 rpm. The 6-cyl unit weighs 2200 lb; the V-12, 3250 lb. On this basis, their specific weights are 7.34 lb/bhp and 5.41 lb/bhp, respectively—claimed the lowest specific weights for any diesel in production today.

Designers, working to meet Navy specifications, provided for interchangeability of most major parts, high fuel economy, easy starting, easy maintenance, and light weight.

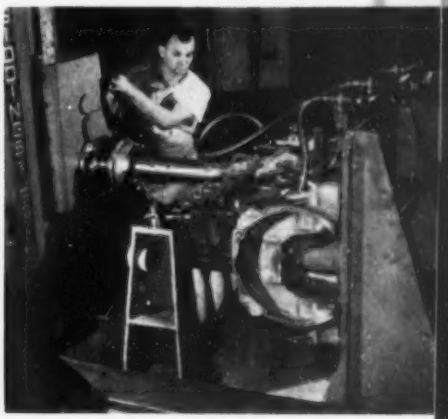
Common to all models are: the integral cylinder-head and wet-liner assemblies, pistons, wrist pins, piston rings, intake and exhaust valves, valve springs and valve guides, main and camshaft bearings, and other minor parts. In addition, fuel injectors and multi-plunger fuel pumps are interchangeable.

The basic cylinder (cylinder head and wet liner assembly) is of 142-cu in. displacement with $5\frac{3}{8}$-in. bore and $6\frac{1}{4}$-in. stroke. Unique combustion system includes a spherical precombustion chamber precision-cast in alloy-steel cylinder head. It is directly over the center of the piston and has removable multiple-orifice burner which ejects hot gases directly onto the dome of the piston. A pintle-type fuel injector in the head feeds metered quantities of fuel into the precombustion chamber. Valves and valve springs also are assembled into the cylinder head.

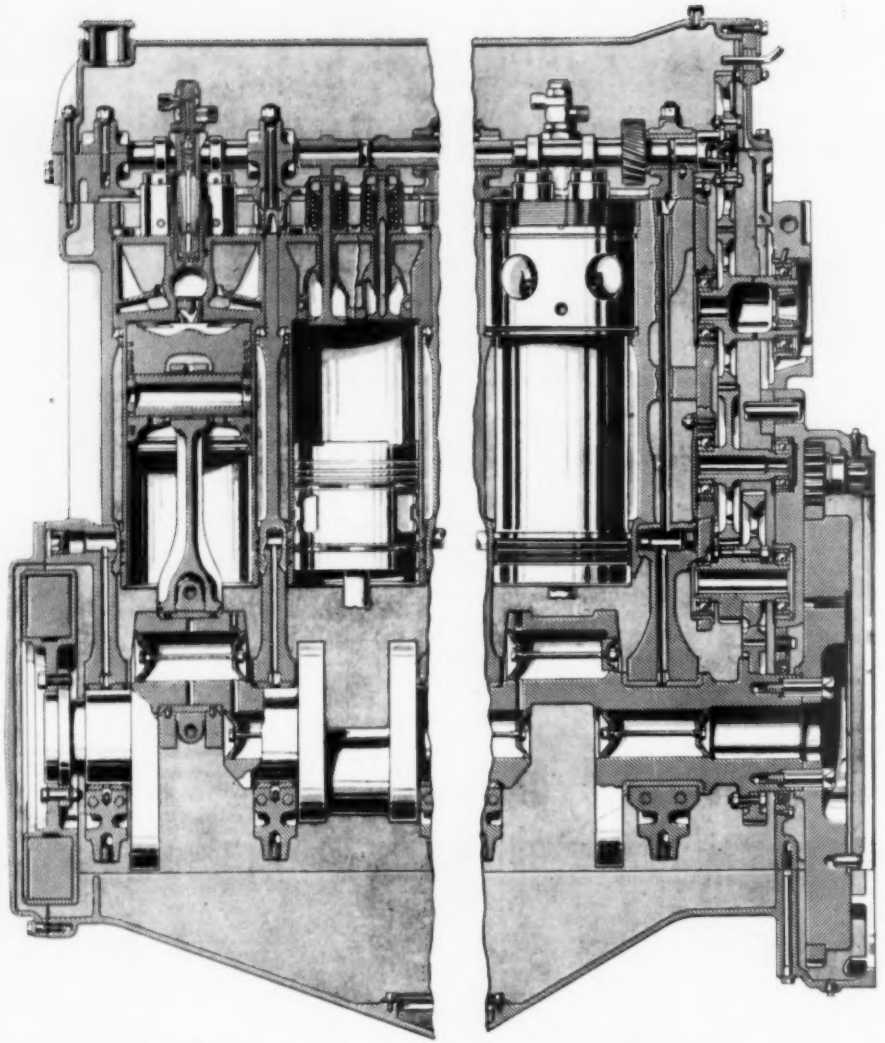
A feature is identical crankshafts in the 6- and 12-cyl models—another characteristic which helps



Cylinder-head faces on V-12 block castings are rough and semi-finish milled at 455 rpm (approx 1665 fpm) with a 14-in. dia, 16-tooth cutter in heavy Hydro-Tel miller. Feed is 5 ipm. Setup is similar for 6-cyl block. Carbide-tipped blades in cutter are set at 15° axial rake and 10° radial rake (both positive). After finish-milling in following operation, surfaces are lapped



Three bars with carbide-tipped bits rough, semi-finish and finish bore fits for cylinder head-and-liner assemblies in this setup on G & L 340T horiz mill for 6-cyl aluminum block. Bars are guided in bronze bushings in fixture. In same setup, 6.875-in.-12 thread for Heli-Coil liner is tapped, and head faces are finished by flycut milling off 0.010-in. stock at 425 rpm with 2-ipm feed

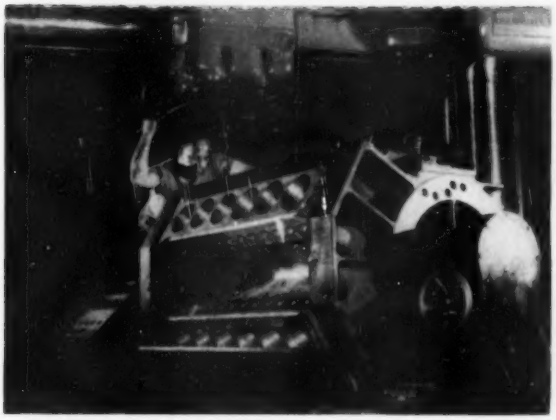


Sectional view of Packard Series 142 diesel engine shows how integral cylinder head-and-liner assemblies are positioned in stepped bores in aluminum block-and-crankcase casting. Each is held in place with a large internal nut, and easily can be removed for servicing. Wherever possible, aluminum is used to minimize weight

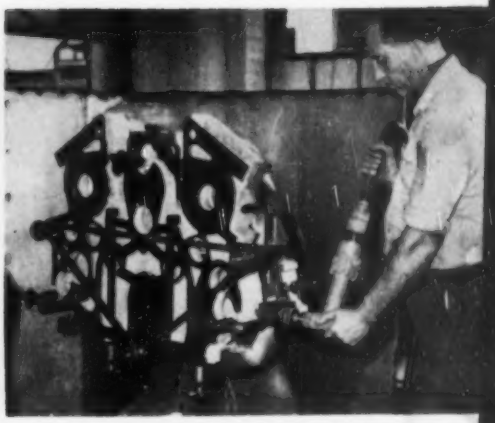
minimize the spare-parts problem. The 7-bearing alloy-steel drop-forged crankshafts are nitrided to insure long service life. They are fully counterweighted and dynamically balanced.

Aluminum is used wherever possible; only functional parts which must withstand high stresses or temperatures, such as cylinder heads and liners, connecting rods, camshafts, crankshaft and gears, are steel. The integral cylinder block and crankcase is an aluminum-alloy casting, as are the oil pan, the valve covers, accessory-drive housings and timing-gear cover. Similarly, pistons, cover plates, intake and exhaust manifolds, supercharger, water pumps, and other accessory items are aluminum.

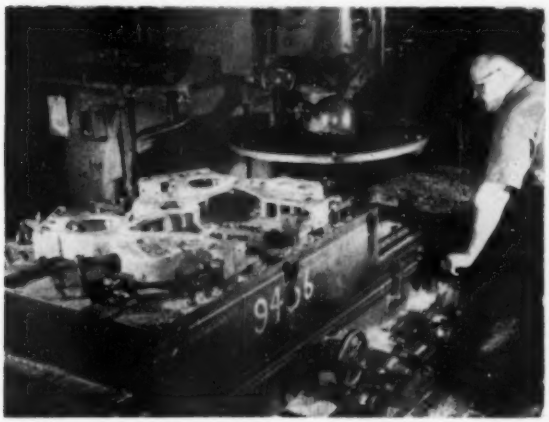
Introduction of these new diesel engines probably will enable Packard to reenter the marine-engine business—when reductions in the current defense production program permit. Because of their light weight and high fuel economy, it is anticipated that the Series



Separate trunnion fixtures hold 6-cyl and V-12 block castings for drilling, reaming, tapping, operations in side faces. In this setup under 6-ft Carlton radial, 32 different tools are used. Each tool has driver for Modern quick-change chuck, so tool change time is minimized. HSS tools are placed in rack in background to protect cutting edges when not in use



Qualifying target-type fixtures check each small aluminum casting at foundry and in machine shop before any operations are performed. Six locating spots are face-milled with cutter in 940-rpm air motor when auxiliary drive housing for V-12 engine is lined up in this fixture. These spots locate subsequent operations. A gage checks milled spots



Three carbide-tipped bits in this 32-in.-dia face-milling flycutter each take a 0.015-in. deep cut when surfacing pads on cast-aluminum drive housing for V-12. Spindle speed of large Cincinnati Hydro-Tel is 190 rpm, so bits travel at 1590 fpm (18.15 miles per hour) during cut. Feed is 0.015 ipm. Surfaces must be flat and parallel within 0.001-in. Note guard plates between cutter arms

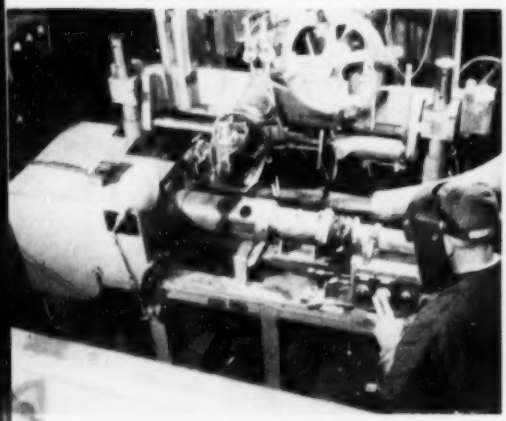
Because production lots are relatively small, precision boring of auxiliary and other drive housings is done in 5-ft radial drills with tools guided at both ends in heavy top and bottom plates of jig. V-12 auxiliary drive housing requires 48 different tools. Each hole must be held within 0.0008-in. tolerance on size, location, and alignment. Speed usually is 62 rpm, feed 0.003 ipr

142 engines also will be usable for many industrial power applications, for large trucks and buses, and for off-highway vehicles.

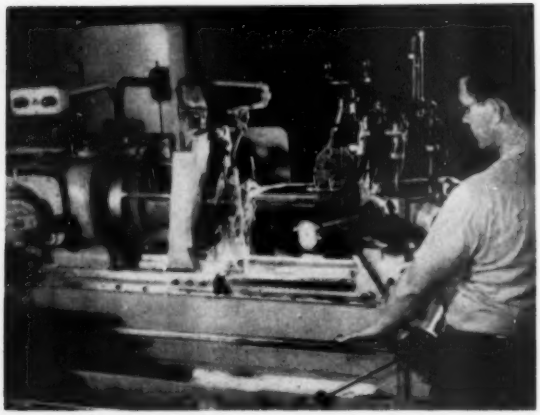
Eventually, Packard intends to develop an 8-cyl inline engine and a companion 60° V-16 engine using the same 142-cu in. cylinder, and as many as possible of the other parts now interchangeable between the 6-cyl inline and 60° V-12.

As production requirements on current contracts are low, as compared with automotive-engine production rates, tooling is simplified as much as possible and conventional machine tools are used for most operations.

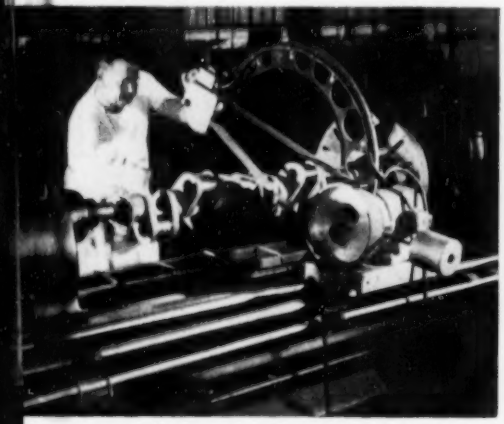
But the close tolerances to which most parts must be finished have made it necessary to build high-order precision into all jigs and fixtures. Several machining cuts usually must be taken to finish most parts within tolerance limits —so machining many engine castings is much more complicated than



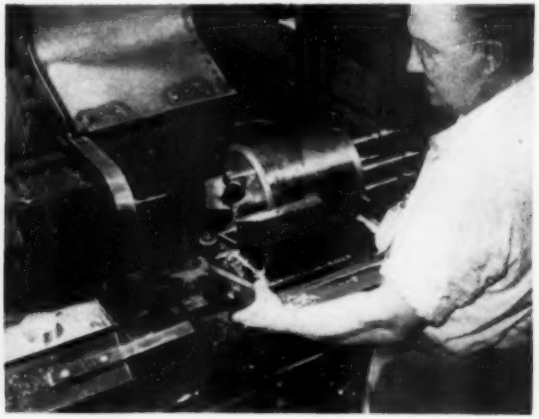
Stainless-steel heads and cylinder liners are joined by Heliarc welding in this special unit developed by Expert Welding Machine Co. Linde head can be positioned along rails to suit different jobs, and can be replaced with Unionmelt head when submerged-arc welding is to be performed. Spindle speed is adjustable



Cylinder head-and-liner assemblies are held in heavy pot chucks for finish boring and facing operations. Setup on turret of this 7A J&L universal turret lathe includes a loading bar for setting job into chuck and five heavy-duty boring bars. Welded-steel steadyrest with three adjustable guide rolls supports chuck



Forged high-alloy steel crankshaft is received finish-machined, and is nitride-hardened for long wear. Journal and throw bearings then are polished carefully with fine abrasive cloth. Preliminary polishing is done with high-speed belt on 3-hp Kotaflu unit on rod ways at rear of 22-in. engine lathe. Crankshaft is rotated at 73 rpm when polishing with power belt, 294 rpm when hand polishing

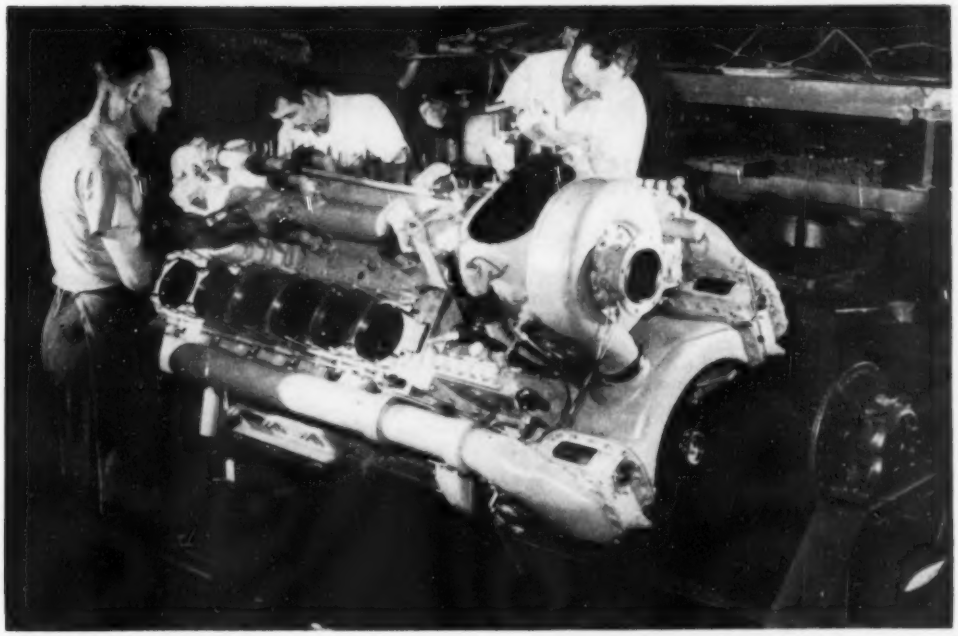


Rod-and-cap bolt holes are precision bored while set up in drum fixture on Ex-Cell-O single-spindle unit. Rods and caps are set interchangeably in fixture, then clamped with quick-lock bar in operator's hand. Precision index plate positions drum in each of four positions successively, and quick-disconnect coupling on cutting-fluid hose permits bringing coolant to each position

normal when aluminum is used.

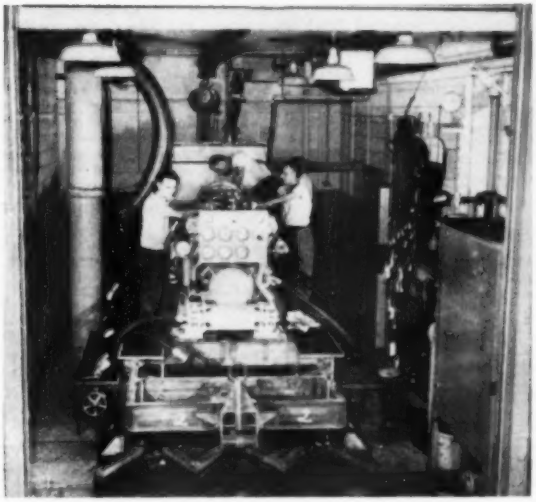
More unusual operations on key engine parts are shown here in the picture-and-caption roundup style pioneered by *American Machinist*. Carbide-tipped tools and high cutting speeds are used wherever possible. Jigs and fixtures are of heavy, cast-iron design to provide solid support for workpieces and minimize vibration.

It is of particular interest to note that Packard's Marine Engine Division, responsible for the production of these Series 142 engines, is in the area used during World War II for production of Rolls-Royce and PT-boat engines. In fact, some supervisors and many workers from the World War II period are back at work there.

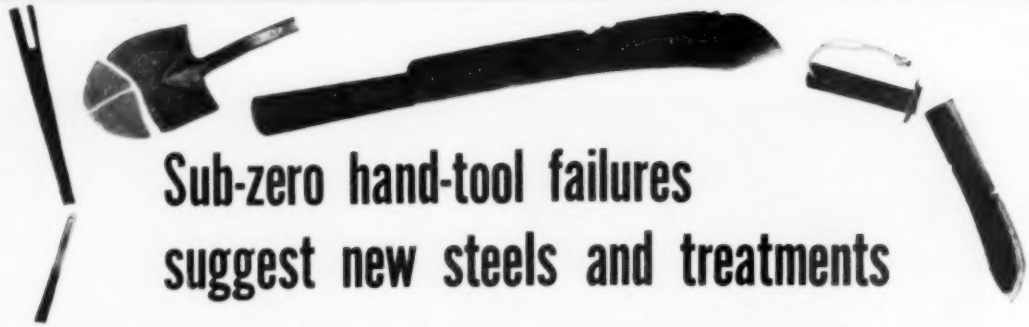


Each engine is tested on a dynamometer stand for more than 21 hr, including nearly 12-hr run-in time, then is returned to the shop for a complete teardown. The engine is mounted on a trunnion cart so it can be positioned to suit workers. Each part is checked for wear and flaws, then the engine is rebuilt (and retested if any parts were replaced) and given a 28-hr final test

Precision-bored rod-and-cap bolt holes are honed to within plus or minus 0.0002 in. of size (0.437-in. dia for the 6-cyl engine, 0.500-in. dia for the V-12) with this Sunnen unit, then checked with the adjacent two-station Precisionaire gage. Similar tolerances are specified for many parts



Final testing of each engine is done after it has been mounted with change-gear box, or generator, on a welded-steel baseplate. Special multi-wheeled carts move engine assemblies from the final assembly floor to dynamometer rooms, which are arranged in pairs, one on each side of each control room, where inspectors put the engines through their paces



Sub-zero hand-tool failures suggest new steels and treatments

BY SAM TOUR,
SAM TOUR & CO. INC.
NEW YORK CITY

"CHISELS, screwdrivers and tools of this type (regular issue) have proved to be entirely too brittle for Arctic operation and are practically useless." This statement by an Arctic authority led the Quartermaster General in January, 1948, to commission Sam Tour & Co, Inc, to determine what steels and heat-treatments are required for hand tools under extreme cold.

Representative tools of various types were supplied for test. Some of the results are shown in Table I. Many of the tools could not be impact-tested; sections were too thin.

A number of defects were found in five types of tools. All are detrimental at normal temperatures, and except for decarburization, much worse at low temperatures.

To obtain specimens large enough for impact tests at low temperatures when the steel is heat-treated to high hardness levels like those in hand tools, samples of ten commercial steels were obtained from producers, Table IV. Tests reported in Table V indicate:

1. Increasing carbon content decreases impact strength at a given hardness level.

2. Silicon, manganese, and molybdenum individually and in combination raise the impact strength at a given hardness level.

3. Phosphorus is detrimental at all hardness levels.

4. The effect of deoxidation practice is indeterminate.

Work reported in Tables I to V indicated the desirability of determining the effect of various deoxidation practices on low-temperature impact properties of a straight 0.45C steel. It also indicated that low-alloy steels containing Mo, Si, and Mn as alloying elements offer considerable promise. Six 300-lb heats were made in an induction furnace to the composition and with the deoxidation practices shown in Table VI.

Results of various hardness tests, Figs. 1 to 5, indicate that at hardnesses of R. 42-44, titanium and zirconium deoxidation of plain 0.45C steel offer something better than aluminum deoxidation, but at higher hardness levels, the relative advantage disappears. Tests indicate also that at high hardness levels, the plain carbon steels are inherently of low toughness.

It is not possible, in the case of Mn-Si-Mo steels, to compare heats deoxidized with aluminum and sodium because of variation in Mn and Si contents. As compared to plain carbon steels, or the commercial steels of Table IV, the Mn-Si-Mo steel at about 0.40C shows an appreciable improvement in sub-zero impact properties at high hardness. This alloy can be made in the open hearth, is free of the

table II—AFTER REHEAT-TREATMENT TO SPHERODIZED STRUCTURE

Part	Sledge	Gooseneck Bar	Crow Bar	Cold Chisel
Carbon, %	0.45	0.58	0.61	0.86
Phos, %	0.023	0.009	0.019	0.014
Rockwell B	91	96	96	98
Rm-Temp Impact	7-9	27-40	33-39	20-27
−80F Impact	2-2.5	13-19	10-16	6-7.5

Impact strength is much improved over that of the same steels in a pearlitic condition, but drops markedly between room temperature and −80F, except for the sledge hammer, which had heavy ferrite bands. The gooseneck bar had very low phosphorus

table III—IMPACT STRENGTH AT HIGH HARDNESS LEVELS WITH REHEAT-TREATMENT

Part	Crow Bar	Crow Bar	Chisel	Axe
Carbon, %	0.61	0.61	0.77	0.82
Phos, %	0.019	0.019	0.036	0.017
Rockwell C	49	58	58	47
Rm-Temp Impact	2.5-3	1.5	2	3-6
−80F Impact	2-3	2	2	3.5-4

Except for the crowbar, available tools would not yield sufficient specimens to determine possible impact strength at high hardness levels with suitable reheat-treatment (quench and temper). Tools available had somewhat different compositions than those in Table I, particularly in C and P. From these figures, it seems evident that, even with full heat-treatment to produce a tempered martensite, it is not possible to develop an adequate impact strength on high-C plain carbon steel in the range from R. 47 to 58. Apparently, the high P in the chisel (which also has 0.50 Cr alloy) is detrimental at either temperature

table I—TESTS ON REPRESENTATIVE

Part	Claw Hammers		Crow Bar	Gooseneck Bar	Crosscut Saw	Nested Saw	Cold Chisels		Claw Hatchet	Pick Mattock	Side-Cut Pliers	8-lb. Sledge	Screwdrivers		Open-end Adj. wrench
Carbon	0.88	0.79	0.61	0.52	0.91	0.80 -0.87	0.86	0.79	0.79	0.62	0.86	0.44	0.57	0.46	0.73
Manganese	0.78	0.43	0.63	0.83	0.41	0.71 -0.89	0.31	0.56	0.69	0.56	0.38	0.60	0.76	0.52	0.67
Phosphorus	0.015	0.015	0.019	0.080	0.022	0.014-0.022	0.014-0.037		0.012	0.034	0.014	0.016	0.023	0.029	0.017
Silicon	0.16	0.15	0.18	0.14	0.17	0.17 -0.22	0.25	0.19	0.14	0.10	0.23	0.05	0.17	0.26	0.19
Ht Treat	DPQT	DPQT	EQ	EH	Q&T	Q&T	PQ OQ&T		DPQ	PQ	PQ	PQ	PQ	PQ	QQ&T
Rockwell Hardness	C56f C24-26c	C53f C33-49c	B95	B90	C46	cC46-50	C54e C21-426	C56	C48e C21-40b	C46e C20-35b	C59j C52h	C53f C45p	C40e C90b	C50e B98s	C47j C46h
Room-Temp Impact	—	—	3.5	3.25	—	—	C21 2.5	1.75	C38-40 3-4.5	C35 3-5	— —	B83 10	—	—	—
80F Impact	—	—	3	2	—	—	C31 2		C40 2-4	C35 3-5	— —	B85 2	—	—	—

Under "Heat-Treatment", D is double, P is partial, Q is quenched, T is tempered, H is hardened, O is over-all, E is end.
Under "Rockwell Hardness", f is face, c is claw, e is edge, b is body, J is jaws, h is handle, p is peen, s is shank, m is point.
Note high phosphorus in items 4, 8, and 10. Item 8 had 0.5 Cr alloy.

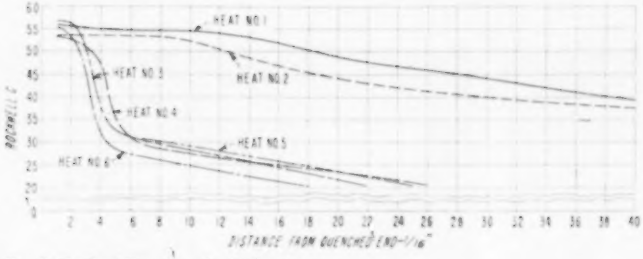


Fig. 1—Hardenability of each of the six steels of Table VI, determined with standard Jominy hardenability specimens

most critical alloying elements, and has excellent hardenability.

Additional work is being undertaken to determine the optimum ranges for C, Mn, Si, and Mo in this alloy for hand-tool hardness levels. It is hoped that the program will develop a steel that will oil-harden readily to a minimum of R_c 55 and have a Charpy impact value of about 20 ft-lb at –80F.

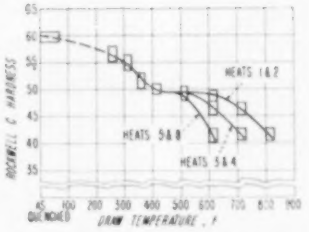


Fig. 2—After suitable quenching, hardness levels for different draw temperatures for the steels of Table VI look like this

table IV—COMMERCIAL STEELS USED IN TABLE V TESTS

Steel Type	1040	1045	1060	1070	1078	1137	4063	9260	Mn-Mo	Si-Mo
C	0.39	0.44	0.59	0.70	0.80	0.39	0.63	0.60	0.70	0.51
Mn	0.67	0.78	0.75	0.80	0.35	1.55	0.83	0.86	0.84	0.35
P	0.022	0.015	0.018	0.016	0.015	0.010	0.046	0.015	0.015	0.014
S	0.034	0.032	0.031	0.030	0.024	0.110	0.028	0.023	0.022	0.013
Si	0.19	0.15	0.22	0.28	0.21	0.20	0.23	2.20	0.26	0.98
Mo		—	—	—	—	—	0.24	—	0.84	0.46
Deox	Si & Al	Si & Al	Si	Si	Si	—	Si	Ferro-Si	Reducing Slag	

Ten commercially produced steels were obtained for tests of impact toughness when heat-treated to the high hardness levels involved in hand tools. 1137 is a high-S 0.40C steel, 4063 an 0.60C-Mn-Mo steel with high phosphorus, 9260 an 0.60C-Si-Mn steel. The last two are commercial alloy steels and electric-furnace products; all others are open-hearth products

table V—IMPACT TESTS ON COMMERCIAL STEELS

Type	1040	1045	1060	1070	1078	1137	4063	9260	Mn-Mo	Si-Mo
R_c	45	48	54	56	60	49	56	55	55	56
Rm Temp	18	10	6.5	5	2	16.5	4	9.5	9.5	12
–40F	16	9	5.5	3.5	2	12.5	5	8	9	13.5
–80F	13	7.5	5.5	3.5	2	10.5	4	6.5	7.5	10.5
Rc	33	34	40	44	42.5	38	47	47	47	46
Rm Temp	63	43	21	12.5	15	28	9	15	11.5	14
–40F	51	35	14.5	11	12	27.5	8.5	14.5	12	14.5
–80F	45	24	14.5	11	10	25.5	7	14	11	13.5

Several full-size Charpy impact test blanks were machined from each steel in Table IV. All blanks were heated and quenched in water, then half were drawn at 400F, half at 800F to produce two levels of hardness. V-notches were ground in all blanks and the specimens finished on all surfaces. Impact tests were made at –40F and –80F

QM TOOLS

4-lb. axe	3½-lb. axe	Alpine Pick	Min. Hammer	Shovel
0.80	0.86	0.46	0.77	0.75
0.48	0.55	0.22	0.63	0.57
0.015	0.010	0.23	0.028	0.017
0.13	0.24	0.03	0.019	0.20
PQ	PQ	PQ	OQ&T	PQ
C56e	C46e	B90	C40-45f	C47e
C20b	C20b	—	C52m	C22-26a
C40	—	B90	—	—
4.5		4		
C45	—	B90	—	—
3.5		2		

Impact values are in ft-lb, and were on half-size specimens in Tables I-III.

table VI—COMPOSITION OF SIX SPECIAL HEATS

No.	1	2	3			
C	0.39	0.39	0.48	0.47	0.47	0.44
Mn	1.00	0.93	0.76	0.68	0.72	0.66
P	0.015	0.014	0.007	0.014	0.013	0.013
S	0.007	0.006	0.005	0.005	0.006	0.008
Si	1.02	0.80	0.15	0.15	0.13	0.21
Mo	0.98	0.98	—	—	0.04	0.04
Ni	0.10	0.09	0.08	0.05	0.06	0.07
Cr	0.16	0.10	0.10	0.10	0.05	0.04
Cu	0.12	0.12	0.12	0.10	0.09	0.08
Deox	Al	Na	Ti	Zr	Al	Control Si

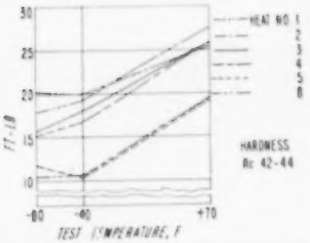


Fig. 3—Impact tests at room temperatures, –40F, and –80F and R_c 42-44 hardness levels of full-size Charpy impact specimens rough-machined from annealed bar stock from each heat, heat-treated according to schedule, finish-ground to size, and a 45° V-notch ground in one side

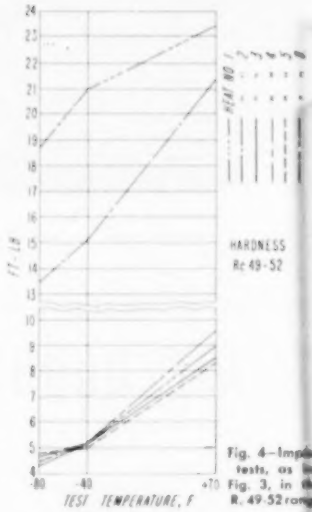


Fig. 4—Impact tests, as in Fig. 3, in the R_c 49-52 range

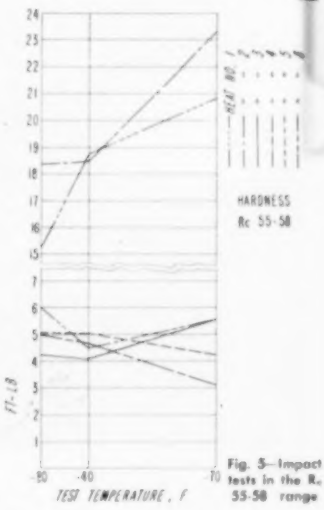
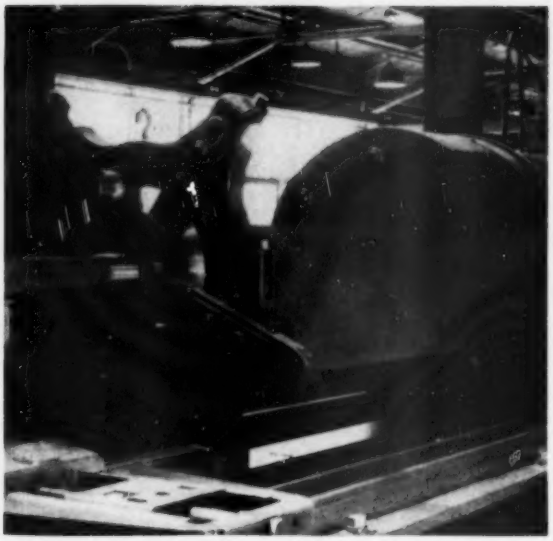


Fig. 5—Impact tests in the R_c 55-58 range

TURNING A TRUNNION on one end of the block was the first step preparatory to drilling and boring. Note the massive counterweight



STEADYREST SUPPORTS WORK on the trunnion for drilling and boring one hole. Trunnion is cut off before work is reversed for second hole

With the right kind of planning...

LATHE DOUBLES AS BORING MILL

By LEWIS CRANSTON, Shop Foreman, The National Supply Co

CYLINDER BLOCKS, after finish milling. Block (right) is turned end for end to show the relative positions of the two holes in each

SCHEDULE congestion caused by a heavy backlog in the Torrence, Calif., plant of The National Supply Co was relieved by adapting a large Niles engine lathe for boring two cylinder blocks, a job ordinarily done on a horizontal boring mill.

The job consisted of boring two blind holes 80 in. deep in opposite ends of each block; each hole offset from center and having a 0.001-in. tolerance on dia. We devised the method of using a lathe by leaving extra metal on each end of the forgings so trunnions for a steadyrest could be machined. Procedure was to machine a trunnion, bore the hole, cut off the trunnion, reverse the forging, machine another trunnion, bore the second hole, then cut off the remaining trunnion before final machining.

Because the two holes were off center, the forgings had to be offset from the center of the lathe chuck. To correct for the unbalance of such a heavy piece, a counterweight weighing almost 2000 lb was bolted to the faceplate. The weight was adjusted until balance was restored and the lathe operated smoothly. Although the overhung weight made the job of setting up rather ticklish, careful handling and maneuvering completed the work without mishap.

How PROSPEROUS Is The USA?

Just how prosperous *are* the people of the United States?

The sole purpose of this message is to help clear up the confusion and controversy that surrounds this important question.

To find out how much prosperity, or material well-being, the people of the United States now enjoy, it is necessary to get answers to these questions:

1. As compared with other times, what is the total amount of goods and services that we have available for our enjoyment?

2. How great, on the average, is the share of each American in this prosperity?

3. How does our prosperity compare with that of other nations?

National Product at Peak

The government statisticians who do the bookkeeping for the nation produce a figure called the Gross National Product. It is supposed to be the total obtained when you multiply the amounts of everything we produce by the prices of everything produced. This year the GNP, as it is commonly tagged, will add up to something like $345 billion.

Since this will be the highest total that GNP has ever attained, some people will acclaim it as evidence that we now are enjoying the greatest prosperity on record.

The GNP, however, is not an accurate yardstick of prosperity. It may go up because of price inflation alone without any increase at all in the output of goods and services. Also the GNP includes very large amounts of goods and services, such as those for the military, which are in fact a result of misfortune rather than of a condition that might properly be called prosperity. Moreover, there is no deduction from the GNP to make allowance for the equipment that is worn out in producing it.

Little Recent Progress

When we make adjustments such as these—to find out how much of our production really is available for the use and enjoyment of the civilian population—the *adjusted* national product since the beginning of World War II comes out about as follows. The effects of price inflation have been removed from these figures.

YEAR	ADJUSTED NATIONAL PRODUCT	
	Billions 1951 Dollars	Index (1948 = 100)
1940	$176.2	76
1946	232.5	100
1947	240.7	104
1948	244.3	105
1949	239.7	103
1950	260.9	112
1951	267.9	115
1952	264.3	114

From this table the fact stands out that progress in raising our level of prosperity has been halting. What progress we have made came in a few dramatic increases before or after a military build-up. Aside from those, the progress has been fairly slow. This year, 1952, it has been particularly discouraging.

Again, when account is taken of the number of people who must share in the goods and services that are available, our progress is even less marked. This is shown by the following table which gives the share of the average American in the national product. This, as the table indicates, is arrived at simply by dividing the total of available goods and services by the population on hand to share in them

YEAR	POPULATION Millions	ADJUSTED NATIONAL PRODUCT Billions 1951 Dollars	ADJUSTED NATIONAL PRODUCT Per Person
1940	132.0	$176.2	$1,335
1946	141.3	232.5	1,645
1947	144.0	240.7	1,672
1948	146.6	244.3	1,666
1949	149.2	239.7	1,607
1950	150.6	260.9	1,732
1951	154.4	267.9	1,735
1952	156.9	264.3	1,685

Here it is clear that we have made little or no headway since the end of World War II.

U.S. Compared to Other Nations

Although we are making slow progress in increasing our prosperity, as measured during recent years by the amount of goods per person, we still are by long odds the most prosperous people on earth. This can be seen from the following table. It offers a rough measure of how the adjusted output of goods and services per person in the United States compared in 1951 with that in a number of other countries:

COUNTRY	PER PERSON
United States	$1,735
Canada	1,231
United Kingdom	614
France	510

To figure more closely "How Prosperous is the U.S.A.?" we must answer a number of other questions. One of the most important will be the subject of a later editorial in this series. It is "Who Gets What?" How have various income classes and occupational groups shared the total available goods?

Another question that has a basic bearing on the quality and durability of our prosperity is "How fast are we using up irreplaceable natural resources, such as oil, iron ore, and copper, to sustain it?" Any attempt to deal with this very complicated question must also be deferred.

A Problem for the Future

In the meantime, however, key facts about our prosperity are that:

1. Most of the increase in the nation's total production in recent years has been to meet military requirements rather than to improve the American standard of living.

2. The increase in the supply of goods and services actually available for the average American has been slow and halting.

3. We Americans are still extremely well provided with the good material things of life, as compared with peoples in other lands.

These three facts bring to mind a whole series of policy questions. What can be done to speed up progress in improving our prosperity? What—to repeat the question discussed in the previous editorial in this series—can be done to make our prosperity less precarious?

Here, however, the purpose is not to prescribe. It is simply to indicate as accurately as it can be done in a brief article the actual state of the nation's prosperity.

In doing this much, it can properly be remarked that the record presents to the American economy both a problem and an opportunity of surpassing importance. It is that of building a prosperity that will be both more progressive and more secure than any we have known in recent years. In the light of what clearly remains to be done, we shall make a grave mistake if we use up any of our energy in congratulating ourselves on the relatively meager progress here recorded.

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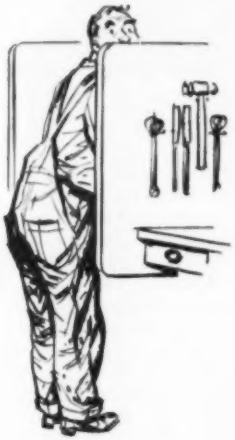
ROUND TABLE

Privacy, Please



"What's the idea of all those little stalls along the bench, Al? You trying to make the place look like a men's room?"

"Nope," replied Al. "It's for efficiency. The idea's to give each man his own sanctum where he can work in peace."

"Well, now, I'm not sure that's such a hot idea," answered Ed. "If you let the guys hide away like that, how're you going to tell what's going on?"

"Those partitions are only going to extend about a foot beyond the bench, Ed, so I'll be able to see well enough if there's any monkey business."

"Are you sure you won't get into trouble with the men? What do they think about it? Do they resent being separated like that?"

"Haven't gotten any bad reaction, yet," replied Al. "I think the men will like the idea when they get used to it. Did you ever hear of anyone objecting to a private office?"

"Well, I sure don't; but how about that efficiency angle? What do you do when you have to have a couple of men working on the same job at the same time? You can't take down the partition."

"Well, I guess we bring the job out to the middle of the shop. We can use those big, long benches in the center of the floor. Besides, there's mighty few jobs that two men can work on around here."

"I'm not convinced, Al. I think you'll discover a TV set hidden away next to one of the partitions after a while. You have to keep everything out in the open, or else you make everyone jealous of his own bailiwick."

"Maybe that's a good point, too, Ed. If each man has his own definite area, he has to keep it cleaned up, or I get on his tail."

"How you goin' to get after 'em when they start shooting craps down at the end, where you can't see into the partition from here?"

"I'll be taking a stroll around the department every once in a while, Ed. Don't worry about that point."

"I don't know, Al. It smells of regimentation, to me, and I think you'll have to tear down those walls after a while."

***WHO'S RIGHT** here? Is there a limit to company fixin's around a shop? Will the men object to changes in working conditions, or are these stalls unimportant? Your ideas and opinions will interest others. Discussions of earlier topics appear on later pages.*

If your plant should burn tonight, who would pay for the loss? The insurance company? No, because . . .

Sorry,

BY WILLIAM W McCALL, BELLEVUE, WASH.

IF YOU ARE the owner of the property, you may be secure in the knowledge that you have sufficient fire insurance to collect the amount of the loss from your insurance company. But what if you are a tenant or lessee? Here your position is not so secure, for even if your landlord carries insurance to protect him against loss of his building, under certain conditions you may be held legally liable for the damage and be forced to reimburse either him or his insurance carrier for the amount of the loss.

Professional insurance brokers state that the hazard most often overlooked in planning insurance programs is fire legal liability for property in your care, custody or control. Less than 1% of all tenants carry fire legal liability coverage.

Much of the confusion surrounding such liability arises because many insurance agents and most insureds do not clearly understand where it differs from standard property damage liability. Assuming that you carry a standard liability policy covering your rented plant and including property damage liability, just how would this policy operate in case of fire?

Generally speaking, the standard third-party property damage liability policy would pay for the portion of the building, or any adjacent buildings, that you do *not* lease or rent, if it were determined that you were liable for the fire. It would *not* cover the portion of the building you occupy, because of the exclusion in the policy for damage to property in your care, custody and control.

Obviously, the mere fact that a fire starts in your plant does not mean that you are liable for the fire, or that your landlord or his insurance carrier will start a lawsuit to recover the damages. It would have to be established that the fire arose from your negligence or that of your employees, but it could take a long and costly court battle to prove your innocence. Furthermore, there are many ways in which you could be held negligent. For example:

1. Where there is direct negligence on your part or the part of your employees in starting the fire, such as a carelessly tossed cigarette.

2. Where there is negligence in preventing the spread of the fire.

3. You may have permitted a condition to exist that was responsible for starting the fire, such as storage of flammable material in unguarded sections of your premises.

4. You may have violated the prescribed fire code for your town or city. Even if you are not aware of such violation, ignorance of the law is no excuse.

Prior to 1948, there were several claims and judgments for fire legal liability, but in that year the General Mills fire brought the matter to a head. In this case, the owners of a manufacturing plant brought action against General Mills for loss suffered through the destruction of the plant by fire while General Mills was operating the plant as lessee. The owner's insurance company paid the amount of the insurance carried, over $100,000. This was short of the actual loss by some $30,000. A suit for the entire loss was brought against General Mills, in the name of the owner, on the basis that the lessee was liable because the fire started from his negligence.

A judgment was rendered in favor of the owner, but was reversed in the court of appeal. The reversed decision was given because of a statement in the lease that loss by fire and ordinary wear was excepted. Even with the reversed decision, the case clearly outlined the fact that a tenant can be held liable for fire damage resulting from his negligence. In another court and another case, the decision might well stand in favor of the owner.

This was verified in another case in which it was established that laws relative to fire protection or building codes must not be violated in order to meet the requirements in a standard lease guaranteeing due care, and that such violation is, in itself, negligence, without further proof. This means that if a lessee makes major changes in the premises and violates a law or ordinance, and it can be determined that the violation was the proximate cause of the starting or spread of fire, he may be held liable for any damages resulting.

These cases created a demand for some form of insurance protection. Several methods of providing coverage have been determined, and the following solutions involve no additional premium.

1. You may be named as an additional insured under the landlord's policies. There have been no court decisions on this, but most attorneys agree that this would prevent the landlord or insurance company from collecting from you if you are an in-

you're not covered

sured and a party to the insurance contract. However, the landlord may not wish to add your name to his policies and you probably would be in no bargaining position.

2. You may request that the landlord's insurance carrier amend the subrogation clause in his policies to exclude claims against you. This, too, may be difficult, as many insurance companies will not waive subrogation rights for underwriting reasons, or because the state insurance laws may not permit it.

3. You may have your lease reworded to exempt you from liability for fire damage. This can be done by a simple waiver such as:

"In consideration of the rent to be paid and other conditions of this lease, it is mutually agreed that the lessee will not be responsible for damage to the premises by fire."

If such a waiver is made after the landlord's fire insurance has taken effect, notify his insurance company and obtain its consent.

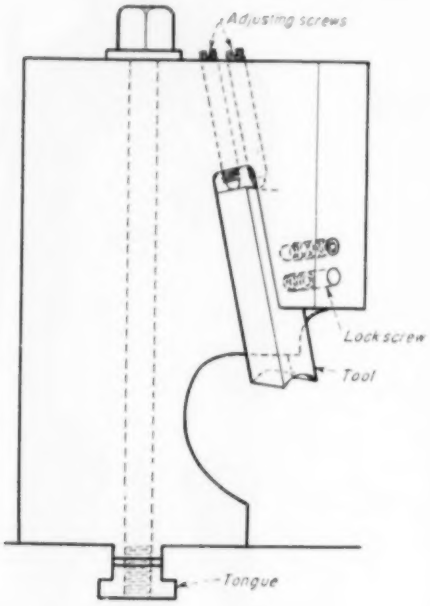
All these methods would require certain concessions of your landlord, and he may not be agreeable to the suggestions. In this case, fire legal liability coverage may be purchased in the following manner:

1. You can buy fire legal liability coverage from a regular fire insurance company covering the portion of the premises you rent or lease. The rate is usually less than for straight fire insurance.

2. You can add fire legal liability coverage to your standard public liability and property damage policy by an endorsement which eliminates the "care, custody and control" exclusion with respect to fire damage. The rate may be as low as 25% of the 80% co-insurance fire rate applying to the building, and you may also include explosion for an additional premium. However, many liability companies do not write this coverage and you may be unable to obtain it from your liability carrier.

Unfortunately, the type of losses involved in fire legal liability claims are often large enough to put the average industry out of business and perhaps into bankruptcy. For this reason, executives who lease or rent their place of business should check their coverage with their attorney and insurance agent. If they are one of the 99% who do not carry fire legal liability coverage they should obtain it by one of the above methods.

Practical Ideas



Grinding Shaving Tools on an Optical Grinder

In optical grinding the projection is always vertical. With simple flat-bottomed tools, everything seen on the screen is the top side of the tool. Regardless of the clearance angle set by the operator on his wheel-slide, there will be no difference in the shape of the cutting edge unless the rake is ground at a different angle in a later operation. (Right- and left-hand clearance will alter profile as the tool wears and is resharpened, but this is not a normal requirement). The helix which gives a shaving tool its gradual peeling action can be considered a side rake. As long as this helix is placed on the tool prior to profile grinding, and is maintained, the same rule applies.

Shaving-tool grinding is much simpler than form-tool grinding. Shaving tools can be regarded as light finishing form tools. The tool shank must not be tilted once it leaves the optical grinder, and shanks and holders must be made accurately. However, if the tool is deliberately tilted on the grinder table and similarly on the lathe cross slide, no error will exist.

Grinding the shaving helix requires considerable material removal. To save this material, plus the time involved, we have developed a method for quickly making cheap tools. An added advantage is that we are able to mount the tools easily without reference to a paper layout.

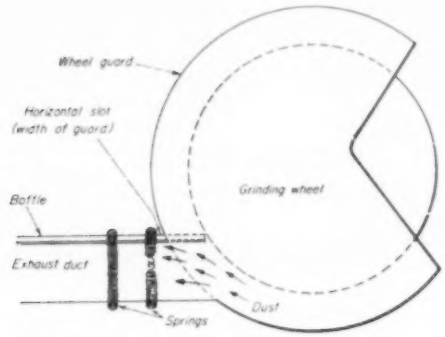
First, we use ground flat HSS as wide as the form, instead of a dovetailed shank. We use fairly thin steel as no great depth is needed as in the case of a dovetail. Shaving action does not set up the severe pressure of a forming tool, and neither deflection nor chatter bother us. Sharpening is relatively simple because we maintain the rake parallel to the bottom of the shank. Often, two shanks are stacked on the grinder table as a precaution against breakage, and to keep the lathe producing while a tool is being sharpened.

A favorite method is to mount the tool above the work at the rear and to run the machine backwards. A helix angle of 30° is used, along with the rake of 15°. This, we find, is a fair average starting point subject to modification as necessary.

These angles are built into both our toolholders and our grinding fixture. The 15° table setting helps to prevent drag as the tool edge returns across the work, because this edge deflects upward as the cut is completed. To prevent the tool from falling out of the hole while we adjust its position, we lightly clamp it with a "ball and spring" setscrew along with adjusting screws for positioning it downward and toward the headstock. We leave the headstock side of the toolholder open and the turret side of it closed, for strength as well as to retain the adjusting screws. This considerably simplifies set-up.—*N Palmer, Paddington, Australia*

Avoid Broken-Drill Trouble

To prevent breaking a piece of drill off at the bottom of a very deep hole, grind an undercut on the shank of the drill just below the portion that enters the chuck. If the drill binds it will break at this point instead of deep in the hole.—*B E Long, Jr, Knoxville, Tenn.*



Controlling Grinding-Wheel Dust

Grinding wheel surface speed is constantly being increased without sufficient effort being made to prevent the wheel from acting as a centrifugal fan. This fan effect can make grinding very unpleasant for the operator as surface speeds reach 9,000 sfpm or higher. As large-section wheels having course grit and bond are used, the tendency to fan becomes greater. A course grit has the effect of gripping air and centrifuging it at high velocity which, unless countered by good guard design, will need more duct suction than is practicable. Thus, wind and dust will blow out onto the workrest and bounce off onto the operator's face and clothing.

Some improvement is gained by keeping the size of the workrest down to allow the wind to slip around it. This is valuable, but three improvements made on the average wheel guard will be more effective.

1. Plug the gap between the wheel-sides and the guard to allow a minimum amount of air to enter around the top area of the flanges.

2. Prevent, by proper baffling, any air or dust from passing the suction duct in a "carried-over" style.

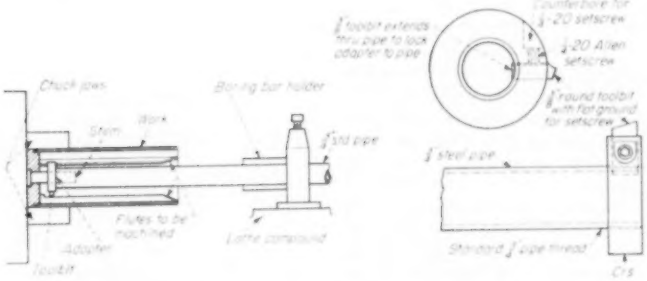
3. Plug the guard sides as well as the top where the wheel leaves it, to prevent air leaving it as well.

To plug the gap between the wheel-sides and the guard, use a strip of stiff rubber and be especially careful to seal the area where the suction duct enters. Old conveyor belting or the side wall of an old large tire will serve the purpose. The rubber strip is attached to each side of the guard with straps and screws so that only a $\frac{1}{8}$-in. gap is allowed for the flanges to clear the rubber.

For the baffles, cut a horizontal slot about $\frac{3}{8}$-in. deep and the full internal width of the duct immediately above the duct. Place a piece of laminated fiber in this slot and clamp it so that it just clears the wheel periphery. For simple clamping use a tension-spring looped around the laminated fiber and the duct. This fastening method allows adjustment to compensate for wheel wear without the use of tools.

To plug the open portion of the guard, modify its sides by beveling them 45° and fitting light steel adjustable plates in place. Sometimes it is possible to attach a resilient material to the guard lip.

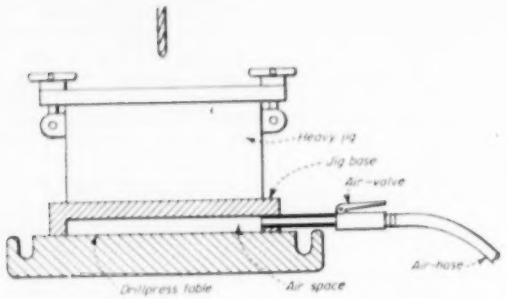
By suitable sealing the comfort and safety possible in grinding operations are greatly improved. This, in time, will improve the quality of the grinding operation. *Neville Palmer, Paddington, Australia.*



Pipe Makes Rugged Boring Bar

Three flutes inside of the cylinder had to be bored to a shoulder. At the same time the boring bar had to clear a stem at the bottom of the cylinder. Grinding was impractical as a quill of that length vibrated excessively. A standard boring bar was too light and lacked sufficient length.

A piece of $\frac{3}{4}$ in. dia standard steel pipe was cut and threaded on one end. To the threaded end was fastened an adapter which was drilled to accommodate a $\frac{3}{8}$ in. dia round tool bit, held in place by a $\frac{1}{4}$-20 setscrew. A flat was ground on the tool to provide a seat for the setscrew. This unit was mounted in a standard boring-bar holder which was held in the toolpost of the lathe. The steel pipe provided a rigid support and the job was completed successfully. *John T McCafferty, Patchogue, NY*

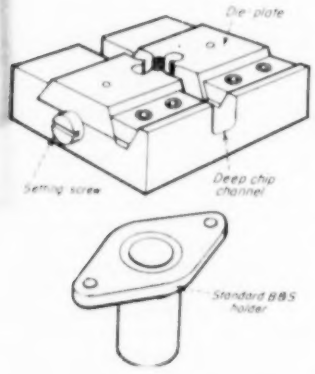


Air-Cushion for Heavy Jigs

Compressed air can do some wonderful things. We had some heavy box-jigs for drilling large components which, during the drilling operation, had to be slid along a lengthy drillpress table over which were positioned four drilling spindles. Sliding the heavy jigs along the table proved extremely fatiguing to the operators, as the flat base-plates clung to the surface of the machine table. The problem was solved by machining a shallow recess in the underface of each jig base-plate. This recess includes the whole of the fixture base except for a margin all around the periphery. The front face of the fixture base is drilled and tapped to take an air tube and the projecting end of this tube contains a trigger-operated air valve and a connection from a shop air hose.

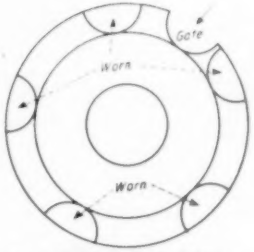
When the valve is actuated, compressed air at 80 to 100 psi fills the recess under the jig and slightly lifts it to clear the table. In this way, the greater weight of the jig is carried by the air and it can readily be moved with one hand. Fine control of the air valve insures that the jig can be floated on an air cushion. Air escapes around the edges of the fixture base and this helps to expel chips which may become trapped.

The weight supported by this air cushion can be considerable. Theoretically, a recess of one square inch will raise a weight equivalent to the shop airline pressure, or 80 to 100 lb. Of course, this idea will work only on machine tables which have uninterrupted surfaces, without T-slots or boltholes therein. We have used the method on T-slotted tables by fitting a flat steel plate over the table top to serve as a platform for the jig. *Clifford T Bower, London, England.*



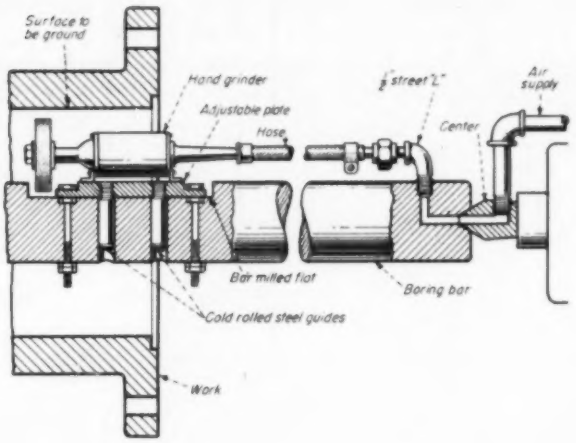
Non-Standard Threading Dies

At various times we have been asked to produce a screw thread having a non-standard pitch. When the material specification calls for a particularly "sticky" thread chip, long and curly, like pure copper, we deviate from the button-die and make a dovetailed die. This is more easily made and more readily sharpened. Then, we make a dovetail holder to fit a standard floating toolholder and attach it with the usual two screws. Die adjustment is simple and very satisfactory. To ease thread cutting, we machine the tool-steel in one piece in place, mounted on the B&S floating holder which we grip by its shank in the collet of the lathe. This die is quickly removed for easy sharpening and will reassemble accurately. More clearance is provided for sticky, curly chips than is offered by the ordinary button-die and holder. A small extra hole is provided in each die-half for wiring pairs of dies together for tool storage. Dies may be stored in bins, or hung on a wooden peg-board for accessibility.—*Neville Palmer, Paddington, Australia*



Reduce Pusher-Plate Wear

Pusher plates on our multi-spindle automatics frequently required replacement as they wore rapidly. To overcome this, we made pads of HSS scrap, hardened and ground to the approximate size of the worn places in the plates, and then brazed them in place. After seven months of use, these inserted plates show no sign of wear. Similar wear plates have now been installed on other automatics. *David Bruce, Philadelphia, Pa.*

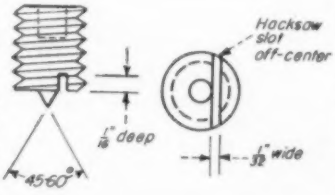


Internal Grinding a Large Bore

As an internal grinder was not available to finsh the bore of our 12-in. ID x 40-in. long CI cylinders, I mounted a hand air grinder on the boring-bar we used to bore the cylinder. The bar revolves, hence it was necessary to get the air supply through the dead-center of the machine. This was accomplished by drilling the center and the boring-bar as shown. It was found the two made an airtight seal.

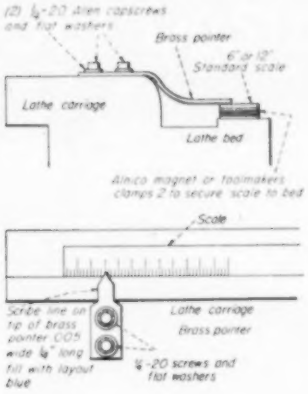
The cylinder is mounted on the lathe carriage with a spider on each end to hold it rigid. Mounted between centers and driven by a dog on the face plate, the boring-bar is unchanged from the boring operation. Brackets attached to the grinder at each end are fastened to a flat plate which is mounted on the boring-bar. This plate contains two CRS guides which fit closely in holes in the boring-bar and two adjusting bolts which run through the bar and are fastened with locknuts at the opposite sides.

Air-hose is used between the grinder and the boring-bar connection so that the grinder may be moved in or out. Less than 0.002-in. variation was found on a 40-in. length of grind, and the finish was very smooth. Although 100 psi. air pressure is used to operate the grinder, no leak was noticed at the joint between the boring-bar and the center. As the grinder is readily dismounted from the boring-bar, much time is saved. Also, the bars do not require changing as the same bar is used for both operations. *B L Adamson, Denver, Colorado.*



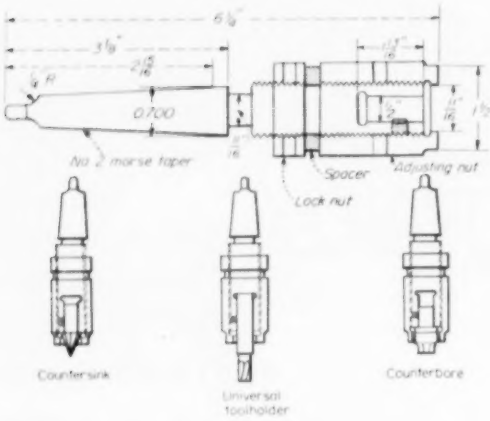
Emergency Transfer Screws

For those who may not be familiar with them, transfer screws are used to transfer the location of a hole tapped in one part to another part, so that a second hole can be drilled to align with the original hole. These screws can be purchased as standard items, and we use them frequently. However, we recently had a rush job which contained holes tapped in the fine-thread series. No standard transfer screws were available. In desperation, we made transfer screws from some semi-hard socket-setscrews. These screws were turned with an HSS tool bit and the transfer slot was made with a hacksaw. This slot will accommodate a screwdriver for setting screws into tapped holes. It took only a few minutes to make these screws and they work so well that we now make complete sets. As the screws are tough, they can take a sharp blow and will last for a long time. As the spotting point wears, the screws can be turned down and their slots deepened. Thus, they last a considerable time. *Joseph Mate, Chicago, Ill.*


(2) ¼-20 Allen capscrews and flat washers
Brass pointer
6" or 12" Standard scale
Lathe carriage
Lathe bed
Alnico magnet or toolmakers clamps 2 to secure scale to bed
Scale
Scribe line on tip of brass pointer .005 wide ½" long fill with layout blue
Lathe carriage
Brass pointer
¼-20 screws and flat washers

Internal Thread Guide

One method for determining internal threading depth that I had found superior to most others utilizes a standard 6- or 12-in. machinist's scale fastened to the lathe-bed by means of two parallel clamps, or an adapter made from a piece of Alnico magnet. A pointer made from a piece of sheet brass is fastened to the lathe carriage by two ¼-20 Allen screws. By simply setting the scale to a reading when the tool is at the shoulder, it is not difficult to stop the tool in the same place each time. *McCafferty, Patchogue, N Y*

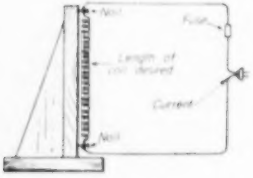


Multi-Purpose Toolholder

Here is a toolholder for use on a variety of machines, including horizontal boring machines, Swiss jig-boring machines, milling machines, and drillpresses. If the taper shank is too small to fit the machine spindle, a taper sleeve is placed over the toolholder shank to provide a proper fit. As shown, this toolholder may also be used as a stop counterbore holder or a stop countersink holder. For this purpose, it is only necessary to adjust the nut on the holder to the proper depth for the holes to be countersunk or counterbored. A spacer is placed between the adjusting nut and the locknut. Thus, the depth of the countersink or the counterbore are readily controlled. The basic device also serves as a universal toolholder when there is no depth limitation. When reaming holes that must be square at the bottom and a specific depth, the adjusting nut can be set and locked in place just as for countersinking. *M Moran, Newark, N J*

Stretching Electric Resistance Coils

Electric heating coils, made of resistance wire and helically wound, should have their turns away from one another to prevent short-circuiting the coil. However, it is more convenient to wind them with close windings, on a mandrel, as this permits using a shorter mandrel.



To stretch the close-wound coil neatly and evenly, hook each end of the coil to two nails partially driven into a wooden board. The distance between the nails should be the final length of the coil. Now, allow current to pass through the coil sufficient to heat it to a cherry-red for a few seconds. When the coil is removed from the nails it will stay in the stretched form. Take care that the coil does not touch the wooden board while heating. As it should hang freely in the air between the nails, the job is most easily done on a vertical board. *Haim Murro, Boston, Mass.*

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Sept. 15, 1952

Floyd Geltz
York, Pa.

Tube Turning Fixture

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PAYMENT — $25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS — Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worrry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

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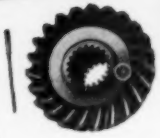

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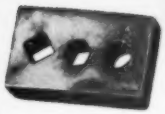
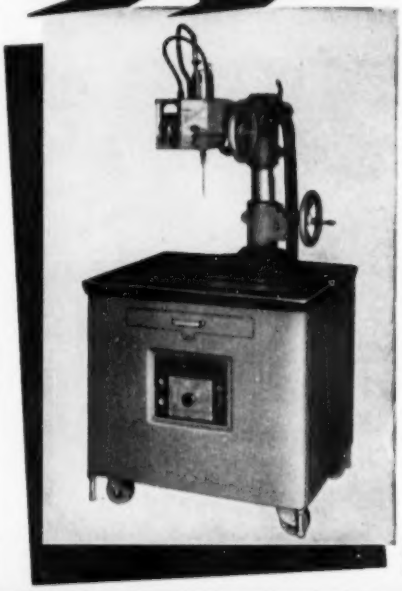
Cut dovetails in hardened dies



Cut any shape hole in cemented carbides



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Pipe Threads...IV

Continued from Nov. 10, 1952 number

BY ELMER ZOOK, Chief Engineer,
DETROIT TAP & TOOL CO

TABLE VI—TOLERANCES FOR TURNS ENGAGEMENT METHOD
for gaging American Standard Dryseal Taper Pipe Threads (NPTF) using L-1 and L-3 basic step plug gages and L-1 and L-2 basic face ring gages

PTF SAE SHORT SIZE	EXTERNAL THREADS					INTERNAL THREADS				
	Turns Engagement L-1 Ring		Turns Engagement L-2 Ring		Difference in Basic Turns Engagement L-2—L-1	Turns Engagement L-1 Plug		Turns Engagement L-3 Plug		Difference in Basic Turns Engagement L-3—L-1
	Max. Size	Min. Size	Max. Size	Min. Size		Max. Size	Min. Size	Max. Size	Min. Size	
1 16—27	1.82	3.32	4.30	5.80	2.48	3.82	2.32	6.57	5.07	2.75
1 8—27	2.36	3.86	4.37	5.87	2.01	3.86	2.36	6.61	5.11	2.75
1 4—18	1.10	2.60	4.48	5.98	3.38	3.60	2.10	6.35	4.85	2.75
3 8—18	1.82	3.32	4.59	6.09	2.77	3.82	2.32	6.57	5.07	2.75
1 2—14	1.98	3.48	4.72	6.22	2.74	3.98	2.48	6.73	5.23	2.75
3 4—14	2.25	3.75	4.89	6.39	2.64	4.25	2.75	7.00	5.50	2.75
1 —11-1 2	2.10	3.60	5.10	6.60	3.00	4.10	2.60	6.85	5.35	2.75
1-1 4—11-1 2	2.33	3.83	5.38	6.88	3.05	4.33	2.83	7.08	5.58	2.75
1-1 2—11-1 2	2.33	3.83	5.57	7.07	3.24	4.33	2.83	7.08	5.58	2.75
2 —11-1 2	2.51	4.01	5.95	7.45	3.44	4.51	3.01	7.26	5.76	2.75

The NPTF L-3 tapered plug thread gage is designed to check the make-up threads and taper of the tapped hole. This plug gage has only four threads at the small end, the balance of its length being relieved below the root of thread so that any error in taper is indicated by a variation in the basic engagement difference between the L-1 and L-3 gages. The basic gaging step is located on the relieved portion and has the same relationship to the face of the product as the basic step on the L-1 gage. Limit steps similar to those on the L-1 plug gage can also be provided.

The NPTF L-2 tapered ring thread gage checks the make-up threads as well as the taper of the external Dryseal threads. It has a width equal to L-2 in Table I of basic dimensions, but is counterbored at the small end so that any errors in taper will cause a variation in the basic engagement difference between the L-1 and L-2 gages. Limit steps similar to those on the L-1 ring gage can also be provided.

Gaging Methods—Three methods of gaging with thread plug and thread ring gages are in use: the turns-engagement method, position method, and limit method. Regardless of the method used, care should always be taken so that gages are screwed up only hand-tight and never forced on the work.

Turns-Engagement Method — The turns-engagement method involves counting the number of turns necessary to unscrew the plug or ring gage from the product. It eliminates the need for estimating the standoff from a basic step, and is accurate although other methods may be faster. The turns-engagement method is the only means of checking holes which are recessed or where a view of the gage cannot be obtained for other reasons. Maximum and minimum turn limits are given in Table VI.

External parts are of correct size when both the L-1 and L-2 ring gages engage the part within the maximum and minimum number of turns shown. To insure that the part has correct taper, the difference in turns engagement counted on the L-2 and L-1 rings must be within one-half turn of the difference in basic turns shown. Likewise, when gaging internal threads, the L-1 and L-3 plug gages must engage the part within the specified number of turns and the difference of their engagement must be within one-half turn of the difference in basic turns shown in Table VI. The decimal parts of a turn shown for plug and ring gages are theoretical, and in practice the nearest ½ turn is usually used.

TABLE VII . . . TOLERANCES FOR POSITION METHOD
of gaging American Standard Dryseal Taper Pipe Threads (NPTF) using L-1 and L-3 basic step plug gages and L-1 and L-2 basic face ring gages

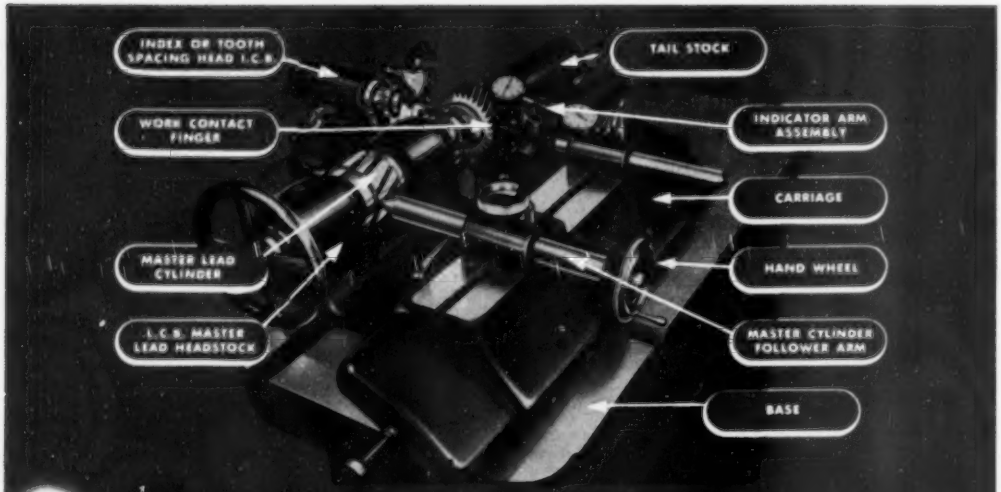
NPTF SIZE	External Threads Face of Gage Position—Threads		Internal Threads Hand Position Threads	
	OFF	ON	IN	OUT
1/16—27	1	1	1	1
1/8—27	1	1	1/2	1-1/2
1/4—18	1	1	1-1/2	1/2
3/8—18	1	1	1	1
1/2—14	1	1	1	1
3/4—14	1	1	1	1
1 —11-1/2	1	1	1	1
1-1/4—11-1/2	1	1	1	1
1-1/2—11-1/2	1	1	1	1
2 —11-1/2	1	1	1	1

The Position Method—The position method of gaging is the one most commonly used, although it is probably the least accurate. Standard gages having a basic gaging face or step are used, and the location of the step in relation to the gaging point of the product must be estimated. In the case of internal threads, the gaging point is the intersection of the pitch line and the chamfer cone, while external threads should be gaged to the first scratch of the thread on the chamfer. The tolerances for the position of the step or face of the gage in relation to the gaging point are shown in Table VIII. Also, to insure correct taper, the position of the L-3 plug-gage notch must not vary more than ⅛ thread from that of the L-1 plug, aud the L-2 ring gage position must be within ⅛ thread of the L-1ring-gage position.

The Limit Method—The limit method of gaging American Standard Dryseal Taper pipe threads is recommended as a practical and fast method of checking. Standard L-1 and L-3 plug gages and L-1 and L-2 ring gages are used, except that gaging steps are provided which represent the maximum and minimum sizes. When using a limit type L-1 plug gage, it is only necessary to ascertain that the gaging point of the internal thread falls between the gage steps and to note its approximate relationship to those steps. The L-3 plug is then applied, and again the gaging point of the part must fall between the limit steps and in the same relationship as the L-1 gage within ½ thread. The same procedure is used in gaging external threads, in which case the gaging point of the external thread must gage between the limit steps on both the L-1 and L-2 ring gages and have the same relationship to the steps within ½ thread on both gages.

DRYSEAL PIPE THREADS PTF (SAE short)

In some applications, economy of materials, space restrictions, or other factors make it advisable to use a shorter



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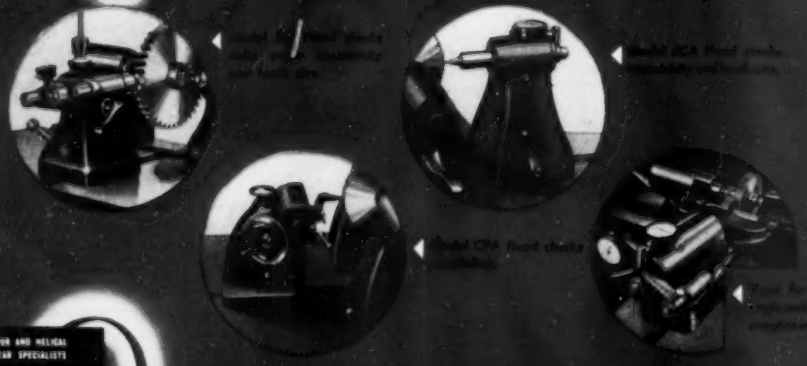

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Pipe Threads...V

thread engagement than provided by the American Standard Dryseal thread. For such purposes the PTF (SAE short) thread is used. The form, taper and general specifications are the same as NPTF threads except that one thread has been eliminated from the small end of the external thread while the internal thread is shortened by eliminating one thread at the large end.

PTF (SAE short) external threads are intended for assembly with Dryseal Intermediate Internal Straight pipe threads (NPSI). They will also assemble with American Standard Dryseal Taper pipe internal threads (NPTF). They are not designed for and may not assemble with PTF (SAE short) internal threads. The PTF (SAE short) internal thread is intended only for assembly with American Standard Dryseal Taper pipe external thread (NPTF).

Taps—PTF (SAE short) internal threads are generally used where the depth of hole is limited so that special taps are required. Such taps are made oversize on the pitch diameter so that the length from the gage line to the front of the tap is shorter than standard and are marked "PTF-SAE short."

Gaging—The method of gaging PTF (SAE short) threads is identical with that used for NPTF threads except that the turns engagement or position is changed as shown in Tables VIII and IX to compensate for the shortening. The product tolerance is also reduced to insure proper assembly of the shortened thread. NPTF Basic step L-1 and L-3 plug gages are used for PTF (SAE short) internal threads and NPTF Basic face L-1 and L-2 ring gages for the PTF (SAE short) external thread.

If the limit method of checking is used, plug and ring thread gages with limit steps adjusted for the PTF (SAE short) tolerances are supplied so that gaging then becomes identical to NPTF practice.

DRYSEAL STRAIGHT PIPE THREADS

NPSF—In the manufacture of commercial products where cost is an important factor, it is often preferable to use a straight internal pipe thread mating with a tapered external thread. Such internal threads are known as American Standard Dryseal Fuel Straight pipe threads (NPSF) and are intended only for assembly with Standard Dryseal Taper pipe (NPTF) external threads. As the most common applications are on the smaller sizes of pipe and tubing, the specifications in Table X below cover only sizes up to and including one inch.

NPSI—American Standard Dryseal Intermediate Straight pipe threads are identical to NPSF threads except that the major and pitch diameters are larger by the amount of taper in one thread of the external part. They are intended primarily for assembly with PTF (SAE short) external threads. NPTF fittings are sometimes used in NPSI threads when the holes are in hard or brittle materials of heavy section so that there is little give for wrench make-up. In such cases, the larger NPSI internal thread provides a more satisfactory length of engagement in the wrench-tight position.

Taps—Standard taps suitable for tapping NPSF threads are available. Special taps which are identical to NPSF taps except for major and pitch diameters are used for NPSI threads.

Gaging—As NPSF and NPSI threads are assembled with tapered external threads, the only accurate gaging method is by the use of tapered plug gages. Standard NPTF basic L-1 plug gages can be used in conjunction with the turns engagement method or the position method can be used as in the case of NPTF threads. Maximum and minimum turn limits as well as position limits are shown in Table XI. L-3 gages cannot be used of course. The decimal parts of turn engagement shown are theoretical and in practice the nearest ¼ turn is usually used.

Limit Type Gages—Limit type gages having maximum and minimum steps can also be supplied for checking NPSF and NPSI threads. When using this type of gage it is only necessary to ascertain that the gaging point of the work falls between the maximum and minimum steps of the gage.

Straight Thread Gages—Some manufacturers prefer to gage NPSF and NPSI tapped holes with go and not go straight thread gages. While this method is not recommended and is not an accurate check, it can be used with some degree of accuracy providing it is used in conjunction with standard NPTF gages as a reference. Straight gages inspect the full length of thread while tapered gages check only the first few threads normally engaged so that a bellmouthed hole which is small on pitch diameter near

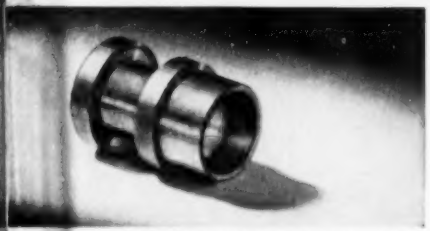
TABLE VIII ... TOLERANCES FOR TURNS ENGAGEMENT METHOD
for gaging PTF (SAE-short) Dryseal Pipe Threads using L-1 and L-3 basic step plug gages and L-1 and L-2 basic face ring gages

NPTF SIZE	EXTERNAL THREADS					INTERNAL THREADS				
	Turns Engagement L-1 Ring		Turns Engagement L-3 Ring		Difference in Basic Turns Engagement	Turns Engagement L-1 Plug		Turns Engagement L-3 Plug		Difference in Basic Turns Engagement
	Max. Size	Min. Size	Max. Size	Min. Size	L-3—L-1	Max. Size	Min. Size	Max. Size	Min. Size	L-3—L-1
1/16—27	2.32	4.32	4.80	6.80	2.48	4.82	2.82	7.57	5.57	2.75
1/8—27	2.86	4.86	4.87	6.87	2.01	4.86	2.86	7.61	5.61	2.75
1/4—18	1.60	3.60	4.98	6.98	3.38	4.60	2.60	7.35	5.35	2.75
3/8—18	2.32	4.32	5.09	7.09	2.77	4.82	2.82	7.57	5.57	2.75
1/2—14	2.48	4.48	5.22	7.22	2.74	4.98	2.98	7.73	5.73	2.75
3/4—14	2.75	4.75	5.39	7.39	2.64	5.25	3.25	8.00	6.00	2.75
1 —11-1/2	2.60	4.60	5.60	7.60	3.00	5.10	3.10	7.85	5.85	2.75
1-1/4—11-1/2	2.83	4.83	5.88	7.88	3.05	5.33	3.33	8.08	6.08	2.75
1-1/2—11-1/2	2.83	4.83	6.07	8.07	3.24	5.33	3.33	8.08	6.08	2.75
2 —11-1/2	3.01	5.01	6.45	8.45	3.44	5.51	3.51	8.26	6.26	2.75

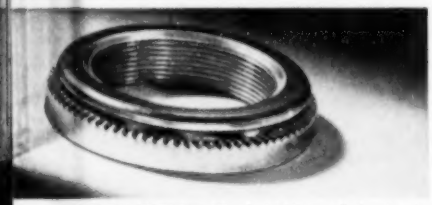
TABLE IX ... TOLERANCES FOR POSITION
of gaging PTF (SAE-short) Dryseal Pie Threads using L-1 and L-3 basic step plug gages and L-1 and L-2 basic face ring gages

PTF—SAE-SHORT SIZE	External Threads Face of Gage Position—Threads		Internal Threads Notch Position Threads	
	OFF	ON	IN	OUT
1/16—27	1-1/2	0	0	1-1/2
1/8—27	1-1/2	0	—	1/2 to 2
1/4—18	1-1/2	0	1/2	1
3/8—18	1-1/2	0	0	1-1/2
1/2—14	1-1/2	0	0	1-1/2
3/4—14	1-1/2	0	0	1-1/2
1 —11-1/2	1-1/2	0	0	1-1/2
1-1/4—11-1/2	1-1/2	0	0	1-1/2
1-1/2—11-1/2	1-1/2	0	0	1-1/2
2 —11-1/2	1-1/2	0	0	1-1/2

LOCK CYLINDER. Metal: 1⅜" dia. brass • Machine: model 601 New Britain Gridley • Operations: *cross slide*—rough form, finish form, break down cut off, side mill, vertical end mill, final cut off; *tool slide*—face, drill offset hole, ream and counterbore offset hole, thread • Spindle Speed: 1,324 rpm • Feed: .006" per revolution • Tools: high-speed steel • Cycle Time: 7.3 seconds



CARPENTER'S PLANE PART. Metal: ⅝" B1113 steel • Machine: Brown & Sharpe Automatic Screw Machine • Operations: *front cross slide*—form; *rear cross slide*—cut off; *turret*—feed stock, spot drill, drill 33/64" hole, tap drill, reverse spindle and tap left-hand thread • Spindle Speed: 1,180 rpm • Feed: .0025" per revolution • Tools: high-speed steel • Cycle Time: 30 seconds



KNOB INSERT. Metal: 1⅞" round aluminum • Machine: model 61 1¼" New Britain Gridley • Operations: *cross slide*—form, knurl, cut off; *tool slide*—spot drill, tap, ream, recess • Spindle Speed: 1,600 rpm • Feed: .005" per revolution • Tools: high-speed steel • Cycle Time: 7 seconds

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MORE THAN 300 PARTS ARE MACHINED with the aid of *one* cutting oil for tools and hardware items made by Sargent & Co. Raw materials worked are: B1113 steel, 11ST-3 aluminum, ASTM-B140-46 Type B half-hard bronze, B16-46 brass, and Type 416 stainless steel. Stock ranges from 1/16" wire to 2" bars.

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A good example of cutting-oil economy and efficiency is provided by Sargent & Co., well-known hardware and tool manufacturers. Their complete line requires the machining of more than 300 parts from a wide range of metals. A few years ago this company was using four different cutting oils, purchased in drums. By switching to a single product, Sunicut 11W, and buying it in bulk, Sargent has been able to effect an annual saving of about $3,000. All operations are performed as well as before, or better—and shop efficiency is up.

Sunicut 11W is a low-viscosity, dual-purpose cutting oil for automatics machining all nonferrous metals and free-machining steels such as B1112 or B1113. Its transparency permits quick and accurate miking. It will not stain brass or copper under normal conditions. It drains rapidly, minimizing carry-off. And its high lubricating and cooling properties aid in prolonging tool life and improving finishes. Moreover, it protects finished parts from rust and corrosion.

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SUNOCO

Pipe Threads...VI

TABLE X . . . SUGGESTED PITCH DIAMETERS
for straight thread gages for NPSF

NPSF OR NPSI SIZE	NPSF GAGES Pitch Diameters		NPSI GAGES Pitch Diameters	
	GO	NO GO	GO	NO GO
1/16—27	.2736	.2789	.2779	.2812
1/8—27	.3686	.3713	.3703	.3736
1/4—18	.4842	.4890	.4877	.4921
3/8—18	.6196	.6244	.6231	.6279
1/2—14	.7692	.7754	.7737	.7799
3/4—14	.9797	.9858	.9842	.9904
1 —11½	1.2378	1.2352	1.2353	1.2406

TABLE XI . . . TOLERANCES FOR TURNS ENGAGEMENT AND POSITION
of gaging NPSF and NPSI threads using L-1 basic step plug gages

NPSF OR NPSI SIZE	NPSF				NPSI			
	Turns Engagement L-1 Plug		Notch Position L-1 Plug, Threads		Turns Engagement L-1 Plug		Notch Position L-1 Plug, Threads	
	Max Size	Min Size	IN	OUT	Max Size	Min Size	IN	OUT
1/16—27	3.82	2.32	0	1 1/2	4.82	3.32	1	1 1/2
1/8—27	3.86	2.36	—	1 2/3±2	4.86	3.36	1 1/2	1
1/4—18	3.65	2.10	1 1/2	1	4.65	3.15	1 1/2	0
3/8—18	3.82	2.32	0	1 1/2	4.82	3.32	1	1 1/2
1/2—14	3.98	2.48	0	1 1/2	4.98	3.48	1	1 1/2
3/4—14	4.21	2.71	0	1 1/2	5.21	3.73	¾	1 1/2
1 —11½	4.15	2.65	0	1 1/2	5.15	3.65	1	1 1/2

the bottom may be rejected by a straight go thread plug, although it is entirely acceptable and will gage properly with an NPTF gage. For this reason, a percentage of parts passed by the straight gages and all parts rejected by straight gages should receive a final inspection with NPTF gages.

As straight gages are not recommended for NPSF or NPSI threads, there is no standard on pitch diameters for such gages. The actual size of a straight thread gage must be considerably smaller than the size indicated by a tapered gage. The amount of undersize depends upon the diameter and pitch of thread and also the amount of bellmouth, taper, etc., produced in the hole. Pitch-diameter limits have been set up which, under average conditions, will provide a reasonable degree of agreement with the proper NPTF gages.

It must be remembered, however, that the use of straight thread gages made to the pitch diameters shown below does not necessarily indicate whether or not a hole is of correct size. As pointed out above, such gages should only be used in conjunction with NPTF gages.

AERONAUTICAL TAPER PIPE THREADS

Aeronautical National Form Taper pipe threads as given in Military specification MIL-P-7105 (formerly AN-P-363) are identical in all respects with American Standard Taper pipe threads except for the E-3 and L-3 dimensions in the 2½ and 3 inch sizes as shown TABLE I, (AM—Nov 10, 1952, p 177). Crest and root flats are the same as shown for American Standard pipe threads Table II. Standard NPT ground thread taps are used to produce the internal threads.

The importance of the Aeronautical Pipe thread specification lies in the gaging system specified which provides a closer dimensional control of the various thread elements than the gages used for American Standard Taper pipe threads or American Standard Dryseal pipe threads.

Gaging Internal Threads—A set of three plug gages is required to gage the internal thread. An L-1 plug gage having a crest flat equal to the maximum root flat of the internal thread is used to gage the pitch diameter of the thread normally engaged by hand, as well as checking the maximum root truncation. This gage must enter so that the basic notch is flush with the face of the fitting with a tolerance of plus or minus one turn.

An L-3 plug gage having a crest flat considerably larger than the L-1 is used to gage the make up threads and taper and it must also check to the basic notch within plus or minus one turn. In addition it must check in the same relationship as the L-1 gage within ½ turn.

The fact that the L-1 and L-3 gages have different amounts of truncation at the crest also allows them to detect errors in form. Errors in thread angle, or a root flat greater than the maximum specified, will cause a variation in the standoff of the L-1 and L-3 gages. When this variation exceeds ½ turn the fittings are rejected. L-1 and L-3 thread plug gages for Aeronautical Taper pipe threads are marked ANPT and are normally supplied with one gaging step representing the basic size. They can also be supplied with three gaging steps representing the minimum, basic, and maximum size.

A 6-step plain tapered plug gage is used to check crest truncation of the internal thread. This gage has three sets of two steps, each set representing the limits of truncation for a thread of minimum, basic, or maximum pitch diameter as determined by the L-1 and L-3 gages. As an example, when the L-1 and L-3 gages enter the fitting so as to indicate maximum size, the face of the part must fall between the two steps of the plain plug gage representing maximum size. Taper errors in the minor diameter can be detected by a shaky fit of the plain gage.

Gaging External Threads—A set of three ring gages is required to gage external ANPT threads. An ANPT L-2 ring gage having a crest flat equal to the maximum root flat of the external thread is first screwed on the part by hand. To be within proper limits the end of the product should be flush with the face of the ring with a tolerance of plus or minus one turn. The operation is then repeated using an ANPT L-1 ring gage having a crest flat considerably larger than that of the L-2 ring. The end of the product must again be flush with the face of the ring within one turn. Also, the relative positions of the L-1 and L-2 rings must not vary more than ½ turn to insure that the thread angle and taper are within proper tolerances.

A 6-step plain tapered ring gage is used to check crest truncation of the external thread. This gage has three sets of two steps, each set representing the limits of truncation for a thread of minimum, basic or maximum pitch diameter as determined by the L-2 and L-1 ring gages. As an example, when the L-1 and L-2 gages indicate that the fitting is minimum size the end of the product must fall between the two steps of the plain ring gage representing the truncation for minimum size. Taper errors on the outside diameter of the external threads can be detected by a shaky fit of the plain ring gage.

TALKING SHOP

Production News

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users say*

case histories of Lusol at work

A JOB SHOP—"41 drills and 25 taps were required for producing 1,984 pieces in 50 hours. Changed to Lusol and produced more pieces in same period with 12 drills and 8 taps."

A MACHINE TOOL BUILDER—"We remove 245 cubic inches of cast iron per hour in that surface grinder. Instead of 17 wheel dressings per chuck load formerly required, only 7 are needed now with Lusol. We're going 100% to Lusol."

A MOLDING MANUFACTURER—"Lusol keeps the machines clean; a distinct advantage over the lubricant we formerly used. The men like Lusol because they can see the work clearly, right up to the time the metal enters the rolls."

A BEARING MAKER—"Look at that fine finish! No smoke around the machine, and the bearing-half comes off the broach so cool it can be gauged for accuracy immediately."

A GEAR MAKER—"Only 4 pieces were formerly produced before milling cutters had to be ground. The solution smoked badly. After changing to Lusol, 8 and 9 pieces per cutter are obtained, and the work remains cool."

AN ORDNANCE MAKER—"Used to get 14 pieces per set of thread chaser on our J & L lathes. Now get 150 pieces with Lusol."

A ROLL GRINDER—"8 hours grinding time, required for finishing 4 diameters in a step roll, was cut to 6 hours by changing to Lusol. And they improved the finish."

**User names furnished on request*

TALKING SHOP

Not Fatigue

WHEN AUTOMOBILES first came in, the early crankshafts broke in service. Engineers examined the crystalline structure at the break and leaped to the conclusion that breaks were caused by alternate fatigue stresses. However, work done by Henry Howe of Columbia on railroad-car couplers, some years before, was remembered by Wyman-Gordon. This had shown that relatively high temperatures in the forging process on simple carbon steel resulted in the coarse structure. Reheating to critical temperature, quenching, and a mild anneal cured the trouble. Prof Howe even worked out a method of determining proper heat-treatment temperature by the color of the forging. The same idea, applied to crankshafts, eliminated much breakage, and concurrent study of the effects of deflection resulted in improvement of designs to cut out fatigue failures from repeated deflection stresses. This was one of the earliest applications of laboratory data to production development and process control.

Bay Assembly

IN MOST machine-tool plants, quantities are not sufficiently large for line assembly, so a unit assembly system is followed, the machine being built up on a selected spot on the floor. Hardinge Brothers have the in-between system, which might be called bay assembly—frequently used on fitted subassemblies in production plants. Each bay is large enough to handle six lathes or six millers on skids, and has its own lathe, grinder, miller and portable tool. Assemblers in that bay are of course skilled on the particular machine type on which they work, and one is usually a scraper hand. Stockbins in each bay carry needed small parts in quantity. Headstocks and other subassemblies are delivered to bays already painted, so the assemblers are encouraged to work carefully and neatly.

Too Loose

EVERY SHOP MAN has heard of tolerances that are too tight—but we've just heard our first example of tolerances that are too loose. Master gears don't have to be exact in diameter, as long as the actual pitch diameter is known. Lead, concentricity, and tooth form are the vital elements; they should, ideally, be exact. That isn't possible, so tolerances of 0.0003 to 0.0005 in., depending on class, are permitted. But the diameter tolerance, according to present standards, is a coarse 0.020 in. Hence, one master-gear maker showed a 0.020-in. tolerance in diameter on his prints, with the notation, "Work to the high side." But lead and tooth form must be measured based on diameter, so the shop found itself in a mess. The final shop request was that an exact diameter be given, with a tolerance of only 0.001 or 0.002 in. each way, in effect tightening the loose tolerance to bear some relationship to the tight ones.

Central Cleaner

ON SURFACE GRINDERS finishing ways, slides, and critical external surfaces, Hardinge has installed a central cutting-fluid system. Copper piping carries used soluble oil to a Hoffman flotation clarifier that removes swarf, then returns it to machines as required. The system avoids microscopic scratches that were formerly a problem.

Noise and Heat

HEADSTOCKS for Hardinge lathes are assembled with preloaded ball bearings to 0.0001 in. total indicator reading, so accuracy is no problem and requires little testing. But headstock bearings must be tested for two other conditions, noise and temperature. A headstock may meet all mechanical requirements, yet be too noisy or heat up too much. Thus both decibel ratings and temperature recordings are made on run tests of every head.

International Instructions

ONE FRENCH LATHE at the Hanover (Germany) Machine-Tool Show carried sketches instead of words to indicate the purpose of each control, thus neatly skirting the problem of language. The coolant switch had a faucet, the light switch a light bulb, the speed lever a hare and an arrow going one way, a tortoise and an arrow the other. We've seen cases here where the idea might work, considering the TV-trained citizens who see and hear but don't read.

Close Safety

WE TALKED RECENTLY with a production man who shifted not too long ago from a plant making conventional gears to one making aircraft gears. His most vivid impression of the differences is not the tolerances, but the extremely small factor of safety. In one recent case, shop men electric-etched identifying numbers on the shafts of gears between spline and gear because that was the only place not ground later. The gear was figured so close in factor of safety that failures began to occur, traceable to the slight stress concentration and hardening caused by the etching. Our friend is thinking that life is sweeter and ulcers fewer in going back to producing conventional gears.

No Scratch

"LIQUID ENVELOPE" materials, the plastic films now being applied in various colors to chromium-plate parts of automobiles to protect them from salt in Winter driving, also has extensive shop use. One company, for example, is coating small parts of stainless with the same material to reduce surface scratching during shop processing.

News of Metalworking

Swan E Bergstrom, President

Herbert L Tigges, 1st Vice President

M A Hollengreen, 2nd Vice President

Progressive Decontrol of Machine-Tool Industry Advocated at NMTBA Fall Meeting

WHITE SULPHUR SPRINGS, W. Va.—Progressive decontrol of the machine-tool industry as rapidly as possible is the surest way to build up the industry for future defense purposes and as the basis for all industrial production, Frederick S Blackall, Jr, president, Taft-Peirce Mfg Co, told the annual meeting of the National Machine Tool Builders' Association in his presidential address at The Greenbrier Hotel Nov 13-14.

"Can anyone doubt that an industry such as ours," he asked, "subjected indefinitely to government regulations, controls, and artificial support, will in time be weakened by the process? To meet the challange which faces us at home and abroad, this industry must be strong and aggressive, and that means, above all, it must be competitive."

Mr Blackall stressed that the industry seeks no subsidy from government, but "we do appeal for sound legislation relating to amortization of our equipment for tax purposes." The industry also seeks recognition, in taxation and renegotiation, of the highly cyclical character of its business so that it may accumulate reserves without penalty in periodic bursts of feverish activity to carry it through the inevitable droughts which follow.

If the machine-tool-export market is to be saved, Mr Blackall advocated these immediate steps: (1) To permit machines to be shipped to European buyers, regardless of enduse; (2) To reverse MSA's policy of discouraging or forbidding purchase of US machine tools with MSA dollars and (3) to negotiate with European nations for relaxation of import restrictions against US machines wherever such restrictions still exist.

There apparently is little or no recognition in Washington, Mr Blackall charged, of the manner in and the extent to which MSA and NPA policies have, however unwittingly, conspired permanently to destroy important segments of the US export markets, historically so vital to the American machine-tool industry.

Since the NMTBA activities concern themselves increasingly with US government agencies, Mr Blackall recommended that the association work be enlarged and a permanent staff member be located in Washington. He also suggested that serious discussion be given to the possibility of moving NMTBA offices from Cleveland to Washington.

The government cannot rely in time of war upon an immediate expansion of the machine-tool industry, Mr A Hollengreen, president, Landis Tool Co and chairman of the NMTBA government relations committee, said in a report read in his absence because of illness by E W Miller, president, Fellows Gear Shaper Co. The purpose of our present defense program should be to develop the capacity to produce weapons in large quantities rather than make the weapons themselves. Mr Hollengreen declared that Pentagon must have a list of weapons which it thinks will be needed in the event of war. It then will be possible to build up the machine-tool industry in an orderly way over a period of years to meet this need. What's more, each metalworking plant making civilian goods should have a department, over and above its regular departments, which could begin overnight to produce armament. The department would be equipped ahead of time with machine tools and would be staffed in an emergency by the company's existing officers, engineers, and workers.

Many machine-tool builders, Mr Hollengreen stated, are following the logical step of having machines of their design made in England or on the Continent. But this is not a satisfactory solution for foreign sales from the standpoint of defense, with a substantial portion of our industry set up for manufacture in Europe. The pressure forcing US builders to start production in Europe should be relieved and the coddling of European competitors abandoned.

The probability of greatly reduced shipments in 1953, the influx of

foreign machine tools, and the prospect of a saturated future market are the most important factors in renegotiation of machine-tool builders, A G Bryant, vice president, Cleereman Machine Tool Co and chairman of NMTBA's renegotiation committee, reported. "The peak of emergency production of machine tools, which is about to pass, will be thinner and sharper than in World War II and will be reflected mainly in 1952 sales and profits," he said. Those profits are being concentrated in a period of high excess profits taxes, price ceilings, and renegotiation. If machine-tool builders are not left with enough peak profits to tide themselves over the coming period of slack so they can continue servicing and necessary research and development, the industry will be seriously weakened and the country's defense capability impaired.

The military must come up with a list of end items for which manufacturing capacity is to be created, Ralph S Howe, retiring director of the Metalworking Equipment Division of the National Production Authority and special assistant to the NPA administrator, said. The fact that armament designs cannot be frozen is a hollow argument. He urged that serious consideration be given to creation of shadow plants to be equipped now and to be used only for munitions production.

The mechanical press standards committee is working on a proposed standard which is as yet tentative, despite the fact that AMERICAN MACHINIST has published part of it. User representatives on the committee understand clearly, Mr Berna stated, that it is impossible to redesign presses at this time. Thus the new standard will be the recommended objective for press builders when the completion of the defense program permits them to consider changes in their products. The standard will apply to terms used and will make dies interchangeable between presses of all makes. The hydraulic press engineering standards committee has just worked out a proposed standard which has been sent to builders for study.

Mr Howe particularly urged adoption of one recommendation which he has made to the Advisory Committee on Production Equipment (Vance Committee) — that there is not enough existing capacity to meet an emergency in two areas: production of long-lead-time machines and of gages. Only by having better machines, not by manpower, can we hope to win another war. Mr Howe brought out the fact that a few machine-tool builders have manufactured many machines under pool contracts for which no orders exist so that the machines must go into storage. This action is a disservice to government and to industry and tends to discredit the pool system.

An annual sales conference, sponsored jointly by the NMTBA and American Machine Tool Distributors' Association, bids fair to become a fixture, Tell Berna, NMTBA general manager, reported. The eighth sales conference at Cornell University last July had 140 students. He revealed that the association's technical standards committee is reviewing a proposed joint American-British-Canadian standard of drafting room practice. The committee on apprentice standards has written a new standard for training machine-tool draftsmen.

The outlook for getting enough trained engineers is not good, Mr Berna remarked. The machine-tool industry must give serious thought to training and retraining men of all ranks and skills. The Cleveland Welfare Federation and Associated Industries plan to issue a book "Careers in Machine Tools" written by Don Knowlton, NMTBA public relations counsel, with the collaboration of Cleveland builders. It is expected to be of value in other communities too.

Mr Berna said that NMTBA directors have decided hereafter to cooperate closely with the International Standards Organization which met in New York last June. Some of the standards under discussion are ill-advised and may depart from US standards already adopted. The British machine-tool industry, Mr Berna said, already has decided to become active participant in the work. The British Machine Tool Trades Association, in fact, is considering adoption of NMTBA electrical standards.

A national machine-tool show every three or four years on a regular time cycle was urged by Frederick S Blackall, jr, NMTBA president, in his address. Shows staged by NMTBA have been too infrequent and haphazard as to date, the result being a growing tendency for other groups to solicit the participation of machine tool builders in their shows. Foreign competition in particular makes a more frequent timing of the shows imperative. The next Machine Tool Exhibition staged by NMTBA is scheduled for September 1955 at the Amphitheater in Chicago.

The rapid and dramatic recovery of the German machine tool industry to its prewar size and strength, thanks partly to ECA financing with our taxpayers' money, constitutes the biggest single threat to the American machine tool industry in its drive to regain its market round the world, Burnham Finney, editor of AMERICAN MACHINIST, declared. "Today," he said, "machine tool production in western Germany, including West Berlin, is equal in physical volume to that in all of Germany before the war."

"Despite this upsurge of competition, particularly from the Germans, it is impossible to find an important machine-tool buyer in Europe who does not acknowledge the continuing superiority of American machine tools. It would be a tragic error for our industry to write off the European market as lost or as shrunk to peanut size permanently. But if our sales are to get back to their former important volume, European governments must remove the controls and rigid licensing arrangements which now stand in the way of European buyers being able to secure machines here.

Swan E Bergstrom, vice president, The Cincinnati Milling Machine Co, was elected president of NMTBA. Other new officers are: Herbert L Tigges, executive vice president, Baker Brothers, Inc, first vice president; M A Hollengreen, president, Landis Tool Co, second vice president; and Francis J Trecker, president, Kearney & Trecker Corp, treasurer. New directors are J C Cotner, president, Hydraulic Press Mfg Co; Alan C Mattison, president, Mattison Machine Works; and Mr Hollengreen.

Metalworking Abroad
(By McGraw-Hill World News)

Brazil to Trade Poland—raw materials for many industrial products including $½ million worth of industrial machinery, plus construction and agricultural equipment.

German Steel is High—production in October reached 1,462,379 tons. Rolled-steel goods totaled just over a million tons in the same month. Pig-iron production is at 1,167,018 tons per month. But export of large industrial machinery is lagging.

S Africa Gets Locomotives—the first two of six from U S makers have been delivered to Rhodesian Railways. Another 23 diesel-electrics have been ordered from Britain.

Mexico to Build Ships—in first yard there that will be able to construct large units. Ships will be for Mexican oil monopoly, Pemex, which has mainly coastwise service.

Australia to Export Holden—all-Australian-made car to New Zealand and South Asian nations. Holden is being produced at high volume, with local demand slackening somewhat.

Rolls Has Auto Shift—a fully-automatic gear box, optional at extra cost on export cars only.

An American Abroad Looks at British Machine Tools

LONDON—Most British-built machine tools do not stack up against heavier and more efficient US models on modern production lines, according to H T Johnson, manager, Production Engineering Div, Vauxhall Motors, Ltd (General Motors) at a meeting of the Institute of Production Engineers last month. Mr Johnson lists these main points against British machines:

- Inefficient service in modern high-production manufacturing lines.
- Weakness and low power that cannot take advantage of modern cutting materials.
- Light design and construction that promotes expensive maintenance.
- No consideration of the maintenance problem and for the machine operator.

Mr Johnson related US experience with the maintenance problem, reported on the careful records kept on machines during the war, and explained the origination of JIC and the work it is doing to simplify machine maintenance and repair.

Turning to current experience with British machines, Mr Johnson listed five British companies that have supplied machines for a new passenger-car line. Typical of the results—one company furnished nine machines which, because of various troubles, caused the loss of 1626 productive hours, averaging 180 hours per machine, in only four months. Two of these machines caused the loss of over 200 hours each.

Quoting the difficulties with machines from another manufacturer, Mr Johnson stated, "In 12 months one machine has been down 22 times for mechanical trouble and six times for electrical trouble. In seven months one machine has been down 17 times for mechanical trouble and six times for electrical trouble. A third has been down 12 times in seven months for mechanical trouble and twice for electrical trouble."

US Designs

"We also have in our plant many machines built in Britain to American design which are definitely not as good machines as those built in the US to the same design. This can only be due to the fact that the British workmanship or materials, or both, are not equal to the American. I have had a lot of experience with these same machines built in the US, and have not experienced the troubles we have had with their British-built counterparts."

In describing results of putting into production a new truck, van, and passenger-car line with the latest equipment, Mr Johnson said, "This new equipment, for the most part, replaced old, obsolete standard general-purpose machines and should have resulted in a substantial saving in production and maintenance costs, but we have not attained the results we should have. When the machines are operating our production costs are reduced, but our maintenance costs remain about the same as with the old machines. . . . Unless the present machine-breakdown situation is improved we will not be able to achieve the rate of production our plant is supposedly equipped for."

"In my opinion, English machine tools are not designed to use present cutting materials to their full efficiency, and certainly will not be able to take advantage of developments to come in the next few years. Ten-horsepower production lathes and fifteen-horsepower milling machines can never hope to perform on a par with the 40- or 50-hp American lathe or the milling machine that uses 30 to 50 hp per spindle."

"Unless the British machine-tool

AUTOMATIC CHAMBER GAGE is demonstrated by Louis Polk, pres, Sheffield Corp, to Major Gen E L Ford, Chief of Ordnance. The 10-ton gage built for Picatinny Arsenal checks loaded and assembled 90-mm shells by automatically rejecting oversize (length or diameter) rounds that might jam in the rifle chamber. Dimensions are checked by air in a chamber that clamps around each shell

builders meet this situation they will not only penalize British industry, but they certainly will not be able to sell any quantity of their machines in America. I know there are a great many British machines being sold in the US. I also know that as soon as the American machine-tool builders catch up on their schedules *that* business will dry up. American industry cannot afford to purchase equipment which will not operate efficiently over long periods of time."

"The average American plant does not buy machine tools entirely on price, but on performance as well. I am continually told by British machine-tool builders that British machines are cheaper than American, but this is not so because the British machine will not equal the performance of the American machine tool. It is high time that the British machine-tool builder got away from his conservative ideas and gave the user of the machines what he wants and should have, to be able to meet world competition, rather than what the machine-tool builder thinks the customer should have."

"One of the first questions I asked when I came to England in 1948 was why we were milling cylinder blocks at only 10 to 12 ipm instead of the 30 to 40 ipm used in American car plants. The answer was that the iron used here was harder and could not be milled at the high feed rates used in the US! The real reason was that the milling machine produced in England did not have the guts to do the job. This I proved by taking Vauxhall cylinder blocks and heads to the US, where we milled them at feed rates as high as 45 ipm on a standard general-purpose knee-type milling machine with a 50-hp motor. Actually the British iron proved easier to mill than the American."

Non-Mechanical Troubles

Mr Johnson covered other parts of machines that deserve criticism:

- Hydraulics are inaccessible, leak, and heat up.
- Oil leakages are expensive and mess up the factory floor.
- Electric motors are sometimes mounted low and inside a cover that forces the repairman to lie on the floor in great danger.
- Switches are often located where chips can fall on them and clog them.

Quoting JIC standards, Mr Johnson urged adoption of these measures by British machine-tool makers. He also stated that, as a result of the deficiencies of British machines, "We have recently installed many German and Swiss machines in our plant, and, for the most part, I would say that they are better than British machines. We intend to continue the purchase of these machines unless the British machine-tool builder decides to forget his out-of-date ideas and makes up his mind to build a better machine tool."

"As for a general program to force the British machine-tool builder to make a better machine, there must be associations or other groups of interested individuals who can make their ideas known and put them into practice."

B & P CUTS MAGNESIUM-PLATE PRICE

DETROIT—A 20% reduction in price of commercial hot-rolled magnesium-alloy plate, 3/16 in. and heavier, has been announced by Howard Perkins, pres of Brooks & Perkins, Inc. This reduces the cost to $.50 per lb. An important aim of the move is to increase industrial use of magnesium plate. The price is higher than that of aluminum by weight, less by volume.

MACHINERY IMPORTERS WORK ON SHIPPING STANDARDS

NEW YORK—At a meeting with United States Lines, American Assn of Machinery Importers proposed standardized shipping and handling methods to reduce damage to imported machine tools. Officials of the line recommended careful marking for center of gravity and sling points.

Plant Expansions

Adamas Carbide Corp, Harrison, NJ, will build a 20,000-sq-ft tungsten-carbide-tool, die, and wear-parts plant in the Town of Kenilworth, N J.

Caterpillar Tractor Co, Peoria, Ill, is building a 600-000-sq-ft replacement-parts manufacturing plant and 300,000-sq-ft storage and parts-processing building at York, Pa.

Combustion Engineering — Superheater, Inc, New York, N Y, will add buildings to its East Chicago steam-equipment plant for warehousing and shipping.

W C Dillon & Co has completed a 12,000-sq-ft plant at Van Nuys, Calif, for laboratory work on instruments.

The du Mont Corp, Greenfield, Mass, has doubled production of broaches and kits with a new plant.

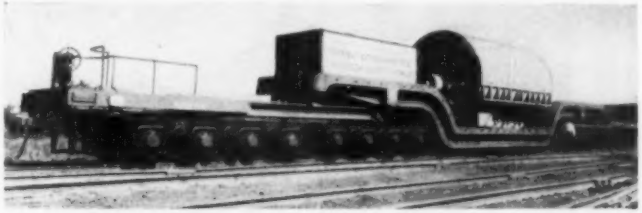
Elett Copper & Brass Co has bought the McDonell Metal Mfg plant at Vancouver, B C, to produce electric water heaters.

General Electric Co will build transformers at a new Rome, Ga, plant to be completed in 1953.

Graver Tank & Mfg Co, East Chicago, Ind, will build an alloy-tank-manufacturing plant at Evansville, Wyo.

Hewitt-Robins, Inc, Stamford, Conn, has dedicated a conveyor-belt plant at Buffalo, N Y.

Kropp Forge Co has announced a new Cicero, Ill, facility that will finish and semi-finish forged parts.



FLAT CAR FOR HEAVY INDUSTRIAL LOADS was built by Pennsylvania RR to take 250 tons. First load was turbogenerator weighing 213 tons. Length is 124 ft, three times that of ordinary flat car. Car is built on seven 3-in. girders, rides on four 8-wheel roller-bearing trucks with double air-brake installation. Center area is depressed to 39.7 in. above the rails to allow maximum load height. Construction is all-welded

Plant Expansions

Lewis-Shepard, Watertown, Mass, is increasing toolroom and machine-shop facilities, including a new building, to work on materials-handling products.

Marlow Pumps, Ridgewood, N J, has established a branch plant at De Queen, Ark, to produce centrifugal pumps.

Parker Rust Proof Co, Morenci, Mich, is serving eastern customers with a new surface-treatment-products plant at Mountain View, N J.

Pratt & Whitney Aircraft, E Hartford, Conn, has opened a North Haven branch that will make parts for reciprocating engines.

Rahn Granite Surface Plate Co has added a wing to its Dayton, O, plant.

Reynolds Metals Co will build an aluminum-reduction plant at Arkadelphia, Ark, to produce 110 million lbs of metal a year.

Rezolin, Inc, Detroit, Mich, has expanded facilities for producing Tool-Plastik stamping-die materials.

Labor Relations Due for Some Changes

WASHINGTON—The new Republican regime will open a new era in labor bargaining in January. Hardest-hit will be the CIO, which has been politically minded and relied on the White House for much aid in winning its battles.

If Phil Murray's successor is unable to keep rival CIO factions from pulling the union apart, it might lead to the end of the CIO. This factor may give Allan S Haywood, CIO executive vp, an edge over Walter Reuther in the jockeying for the union-president's job. Reuther, considered socialistic, might have the effect of pushing conservative CIO members over to the AFL.

New labor power is Dave Beck, AFL teamsters president. He supported Eisenhower, and should have influence in Washington. He's also moving his union headquarters from Indianapolis to Washington.

Although labor-protecting legislation is over for a while, repressive action is not in sight. The change will be in how existing laws are administered, with NLRB, whose members have five-year terms, one dropping out each year, dragging its heels somewhat.

Magnesium Assn Meets, Hears About Plane Wings

NEW YORK—Growing use of magnesium in aircraft highlighted the 8th Annual Meeting of the Magnesium Assn held here Nov 10 and 11. Nearly a third of magnesium is now going into aircraft—about half of it being the new zirconium alloy.

Capt Dale Black, Wright Air Development Center, reported on redesign of the F-80 jet fighter wing as a thick-skin magnesium assembly. Parts were reduced to 31% of the conventional wing, fasteners to 34%, and about 20% more useable internal volume was obtained. Torsional rigidity was increased 50%.

Seven of these wings have accumulated up to 1000 hours of flight time. The remaining airframe components of the F-80 are being redesigned for thick-skin construction of test models.

The B-36 is using about 8 tons of magnesium per plane, and the H-19 helicopter, 600 pounds (17% of the total).

A 16-ft sand-cast wing section for Northrup was reported by W D Stewart, Aluminum Co of America. Minimum section thickness is ¼ in. F L Coenen reported that Boeing is forming alloy sheet in drop hammers.

Automotive experience was reported by F H Mason of Chrysler who stated that no serious objections have been encountered which would restrict the application of large volumes of magnesium. It is being used in die castings and permanent mold castings primarily for parts where cost is reduced, rather than for weight saving.

A W Winston, president of the Association, announced that the first International Magnesium Exposition will be held starting March 31, 1953, at the National Guard Armory, Washington, D C. New officers elected include J S Kirkpatrick, Brooks & Perkins, president; W C Murray, Utica Radiator, vice president; and R D Taylor, Federated Metals Div, American Smelting & Refining, treasurer.

X-RAY DIFFRACTION SCHOOL held at North American Philips Co, Research and Control Instruments Div, was 13th semi-annual laboratory session. Here Arthur C Sweeney, Industrial X-Ray Inspection Co; George Chapman, The Carborundum Co; and Herbert W Conner, Wm Wrigley Jr Co, listen to description of Norelco X-ray spectrometer by William Zingaro

NEW NTDMA OFFICERS are (l to r): Joseph N Huser, pres, B&H Specialty Co, Secretary; Jerome H Stanek, vp, Stanek Tool Mfg Co, Second Vice-President; Alfred Reinke, pres, Gus Reinke Machinery & Tool Co, President; Herbert C Murrer, pres, Murrer Tool Co, First Vice-President; and Philip R Marsilius, vp, The Producto Machine Co, Treasurer

Tool and Die Manufacturers Assn Talks Automation, Human Relations

ROCHESTER, N Y—The seventh annual meeting of the National Tool and Die Manufacturers Association, Oct 30 through Nov 2, was attended by about 250 shop executives who were briefed on current trends in tooling. A J Hole, gen mgr, Metal Stampings Div, Ford Motor Co, stressed the importance of early cooperation between tooling and production planning because of the shift to automation.

K P Martin, asst mgr, Cincinnati Milling's Machinery Div, indicated a general interest in less chip-making and more forging and forming to size. His company's interest in Hydroform equipment typifies present industrial concentration on moving parts from the foundry to the grinder, skipping as many in-between operations as possible.

Dr Raymond Villers of Rautenstrauch & Villers advised owners of small shops to pick up big-shop managerial controls to improve coordination or efforts, cost control, and to introduce forecasting and budgeting. Whiting Williams, consultant in human relations, declared that recognition and attention on the job is more important to the American worker than his hunger for food. He warned that considerable labor discord is caused by management's failure to take care of pety annoyances, and urged more personal contact, better explaining, and more praise when deserved.

A M Balzer of the National Safety Council noted that safeguards used extensively in big shops are lacking in most small shops, which accounts for the fact that small-shop safety records are not nearly as good as those of large manufacturing plants. Hidden costs of accidents, such as time lost, turnover, and high insurance, are often three to four times the direct costs of disabling accidents, he said.

Other events during the meeting included a panel discussion on training and holding workers, with John Gibson, director of industrial and public relations, Graflex, Inc, as moderator. Panel members were E K Jenkins, asst dir, U S Bureau of Apprenticeship; John A Barth, vp, Barth Stamping and Machine Wks, and Frank H Wikstrom, vp, Frank G Wikstrom & Sons, Inc.

Canada Approaches Engineering Standards

VANCOUVER, B C—Professional-engineer registration across Canada is approaching standardization, according to Dean R M Hardy of the University of Alberta at a meeting of the Assn of Professional Engineers here.

Stumbling block in the program is establishing a standard of years of experience after graduation from college that should be required. Presently Canadian provinces differ in requirements as much as do the states in the US. The Dominion Council committee working on the project has suggested two years of experience as the standard.

CALENDAR OF MEETINGS

Nov 30-Dec 5—American Society of Mechanical Engineers, annual meeting, Hotels Statler and McAlpin, New York.

Dec 3-5—Society for Experimental Stress Analysis, annual meeting, Hotel McAlpin, New York.

Dec 3-5—American Management Association, manufacturing conference including aspects of pushbutton factories and manufacturing applications of atomic research, Hotel Statler, Cleveland.

Jan 8-9—Midwest Research Institute (cooperating with local societies), symposium on automatic computing equipment, Kansas City, Mo.

Jan 19-22—ASME and SAM, plant-maintenance conference and show, Cleveland Public Auditorium, Cleveland.

New Research Labs

Batelle Memorial Institute has announced plans for new branch laboratories in Frankfort Main, Germany (for chemical, metallurgical, and engineering work), and in Geneva, Switzerland (industrial economics and research). Both will extend fellowships.

Bjorksten Research Laboratories has announced a non-profit foundation to further pure and applied research, and to aid in developing and patenting new discoveries. Offices are in Madison, Wis.

Chase Brass & Copper Co has reorganized research activities in a new building in Waterbury, Conn. Work will be mainly metallurgical.

Maytag Company is building a research and development laboratory in Newton, Iowa, to work on new products.

Northrup Aircraft has completed a new Anaheim, Calif, process laboratory where full-scale tests can be made on metal for T-41 optical range finders.

The Trane Co, LaCrosse, Wis, is building a weather laboratory where temperature, humidity, pressure, and air flow will be studied in relation to heat-exchange problems.

Neil A Moore

Ronald D Gumbert

James M Mead

William J Pinkerton

Names in the News

Neil A Moore has been elected president and a member of the board of F L Jacobs Co; he succeeds **Clare S Jacobs**, retiring. Mr Moore has resigned his post as vice president of Federal-Mogul Corp to accept his new appointment.

A M Cox, president of Pittsburgh Commercial Heat Treating Co, Pittsburgh, has been elected president of the Metal Treating Institute. Mr Cox is also president of J P Devine Mfg Co, and Pittsburgh Wire Form & Mfg Co.

Milton E Trueman has been appointed works manager of the Chrysler Trenton, Mich, plant. Mr. Trueman, who joined Dodge Brothers in 1925, has been executive assistant to the staff master mechanic of Chrysler Corp since July 1, 1948.

J E Kiefer has been named vice president in charge of sales and engineering, Arms-Franklin Corp. Mr Kiefer has been associated for many years with Stamco, Inc, as chief engineer and sales manager. Additional appointments include: **Lloyd L Dalbey**, treasurer and controller; **E A Matteson**, engineering consultant and sales engineer; **Karl W Matthes**, chief engineer; **John C Holdgate**, assistant to the president in charge of production; **Charles W Goodrich**, assistant chief engineer; **Alfred E Tieg**, chief draftsman.

Thomas F MacLaren has been appointed Chicago representative of Browne & Sharpe Co, succeeding **Howard K Jackson**, given special assignments by the home office. For the past two years Mr MacLaren has been manager of the company's Los Angeles office.

Ronald D Gumbert has been appointed executive vice president of Alloy Precision Casting Co, Cleveland. Mr Gumbert formerly served as production supt at the Pittsburgh plant of Armstrong Cork Co.

James M Mead has been elected assistant vice president of Joseph T Ryerson & Son, Chicago. Mr Mead has been managing the NY steel service plant of the company for the past six years; most recently he has been serving as first assistant to the vice president in charge of purchasing, procurement and merchandising.

George Peterson, Jr, has been named director of aircraft sales of the Camden Forge Co, Camden, NJ. He was formerly associated with the Riverside Metal Co, in charge of its Special Products Div.

Solomon R Baker has been elected president of Pyrene Mfg Co, Newark, NJ. Mr Baker is also president of Pyro, Inc, which recently purchased a majority stock interest in the company.

William J Pinkerton has been named vice president in charge of manufacturing, Micromatic Hone Corp, Detroit. **Arthur B Kowalski** has been appointed factory manager, succeeding the late **Herman Thaler.**

Nelson S Hibshman, dean of the School of Engineering at Pratt Institute, Brooklyn, has been appointed assistant secretary of the American Institute of Electrical Engineers. **Walter J Barrett,** electrical coordinating engineer for NJ Bell Telephone Co, succeeds Dean Hibshman as treasurer, and **L F Hickernell,** chief engineer of the Anaconda Wire & Cable Co, will replace Mr Barrett on the board of directors to fill out his term ending July 31, 1954.

B Frank Quintilian has been elected vice president in charge of engineering, Gerotor May Corp. Mr. Quintilian has been associated with the firm for 20 years; most recently he has served as chief engineer.

Harold C Olson has been named works metallurgist for the Los Angeles plant of the Lindberg Steel Treating Co. Mr Olson was formerly affiliated with the Melrose Park, Ill. works of International Harvester Co.

OBITUARIES

William Ray Culbertson, 62, a vice president of Rust Furnace Co, died October 29 at Mt Lebanon, Pa. Mr Culbertson joined the organization as general manager in 1932, and was elected a vice president in 1945.

Ernest J Abbott, general manager of Micrometrical Mfg Co, died October 6 at Ann Arbor, Mich.

Joseph Minarik, president of the Abart Gear & Machine Co, Chicago, died October 24.

Frank E Russell, 77, locomotive designer and inventor, died October 20 in Sacramento, Calif. As chief mechanical engineer for Southern Pacific Co, he produced a number of inventions; in 1940 he was honored by the National Association of Manufacturers for his work.

Charles A Brizzolara, 59, works manager of Danly Machine Specialties, Inc, died October 23 at River Forest, Ill.

AiResearch Turning Out Lightweight Air Turbine Starters

PHOENIX, Ariz—Production of air turbine starters is well underway at the new $5-million plant of AiResearch Mfg Co of Arizona, with initial deliveries to the Navy scheduled for last month.

Starter units being produced here are in the 35-air hp class, capable of starting a turboprop engine in less than 15 seconds. Units weigh about 17½ lb, contributing min weight as a main engine accessory. Starter is an integral part of the pneumatic power system, which includes a gas turbine compressor and motor, and air turbine motor. Turbojet or turboprop plane equipped with the complete pneumatic system is virtually independent of a home base, since it is self-sufficient—except for fuel—for starting, electrical power on the ground and in the air, ground air-conditioning, and heating.

Westinghouse Building Mobile Power Plant for Engineer Corps

PITTSBURGH—A mobile power plant—first of its kind ever built—will be constructed by Westinghouse Electric for the Corps of Engineers.

The unit, designed for supporting military operations in the field, will consist of a 5000-kw gas turbine power plant mounted on two railway cars. Turbine using distillate fuel will be housed in the first car; second car will contain a transformer capable of producing 2500 to 15,000 v.

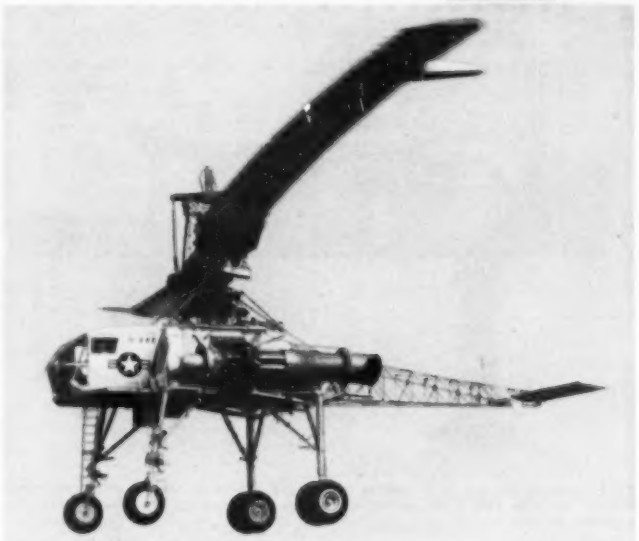
Construction of railway cars has been subcontracted to Puget Sound Bridge & Dredging Co of Seattle, where final assembly will take place.

Navy Orders Sapphire Jets

WOOD-RIDGE, NJ—The Navy has put in a large order for J-65 Sapphire jet engines to be filled at Curtiss-Wright's Aeronautical Div here.

Navy plane scheduled to be equipped with the power plant has not been disclosed; it is presumed, however, that the North American FJ-3 Fury fighter is the likely candidate.

This second-largest order supplements Wright Air Force contracts to provide Sapphires for use in the Republic F-84F Thunderjet, and the Martin B-57 bomber.



WORLD'S LARGEST HELICOPTER, the XH-17 built by Howard Hughes Aircraft Co for the Air Force, makes its first hop during test operations at Culver City, Calif. Heavy-lift experimental machine is the forerunner of cargo-carrying helicopters for lifting and delivering artillery, bridge sections, and trucks in areas inaccessible to conventional aircraft. Rotor blades extend 125 ft from tip to tip; overall height is over 30 ft

LATEST DEFENSE CONTRACTS

ARMY ORDNANCE AWARDS

Frankford (Pa.) Arsenal

Armco Steel Corp, Middleton, Ohio—steel disks, end use, cartridge cases, $110,000.

Waltham Watch Co, Waltham, Mass—steel pinions, $138,305.

Norwalk Lock Co, New York—end use fuzes, $134,750.

Revere Copper & Brass, Baltimore, Md—end use brass cartridge disks, $1,680,076.

Eastman Kodak Co, Rochester, NY—end use fuzes, $154,569.

New York Ordnance District

Eisen Bros, Inc, Hoboken, NJ—burster castings, $695,700.

Eastern Tool & Mfg Co, Belleville, NJ—increment assy holders, $148,641.

Chicago Ordnance District

W A Sheaffer Pen Co, Fort Madison, Iowa—delay element M1, non-delay element M2, $324,443.

Allis-Chalmers Mfg Co, Milwaukee, Wis—right & left drive assy, $202,715.

New Monarch Machine & Stamping Co, Des Moines, Iowa—complete charge assys, $190,502.

Philadelphia Ordnance District

Acme Mfg Co, Philadelphia—shell fins, $198,645.

Mack Mfg Corp, Washington, DC—trucks, $9,888,411.

NAVY AWARDS

Navy Purchasing Office, Washington 25, DC

Greenfield Tap & Die Corp, Greenfield, Mass—stocks, taps, threading sets, $190,459.

Brown-Brockmeyer Co, Dayton, Ohio—electric motors, $144,542.

Philadelphia General Stores

Revere Copper & Brass, Inc, Baltimore, Md—heat exchanger tubes, $117,778.

Anaconda Wire & Cable Co, Hastings-on-Hudson, NY—hydraulic door closers, $131,822.

Carb Mfg Co, Brooklyn, NY—aluminum couches, $172,690.

Harnischfeger Corp, Milwaukee, Wis—welding electrodes, $256,140.

Emeco Corp, Hanover, Pa.—aluminum chairs, $178,233.

AIR FORCE AWARDS

Philadelphia Supply Office

Eastern Industries Inc, New Haven, Conn—aircraft windshield pumps, $126,632.

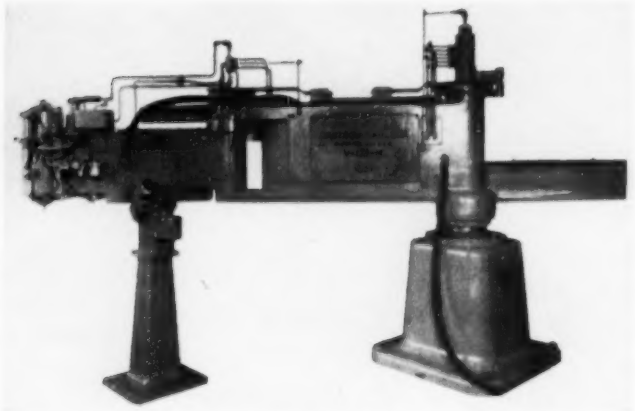
Breeo Mfg Co, Baltimore, Md—socket assys, $132,569.

Scintilla Magneto Div, Bendix Aviation Corp, Sidney, NY—harness assy, $140,305.

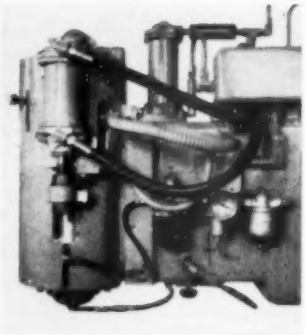
Stewart-Warner Corp, Indianapolis, Ind—thermo switch assys, $149,539.

Cornelius Co, Minneapolis, Minn—aircraft compressors & regulators, $1,011,597.

New Shop Equipment



Power router covers 4 x 12 ft working area in one position of rotation about the support column. The arms have a box section and operate in Timken tapered roller bearings with provision for take up



Router head is equipped with draw-bar collet having a max. capacity of ¾-in.-dia straight shanks. A removeable cost member on the head receives the non-rotating pattern followers

Radial Router Has Retractible Cutter Head

The use of tougher-cutting aluminum plate in aircraft manufacture necessitated this power router. It has changed a slow, back-breaking manual job into a machine-tool operation.

It consists of a base, main turret, two hydraulic power-operated arm sections, a router head, remote-control station, a complete hydraulic panel, and the electric panel. High-cycle current must be supplied to the head from an outside source.

Feeding power is applied to each of the two arm sections by means of a hydraulic cylinder, rack and pinion. The cylinders and racks are integral with the arms and the pinions are integral with the posts.

The arm sections are equipped with magnetic electric brakes. During normal operation the brakes are energized with a low-voltage current to assure smoothness of feed. When the cutter is plunged into the work or when the arms otherwise are brought to rest, the voltage is automatically increased to maximum and the arms are rigidly locked.

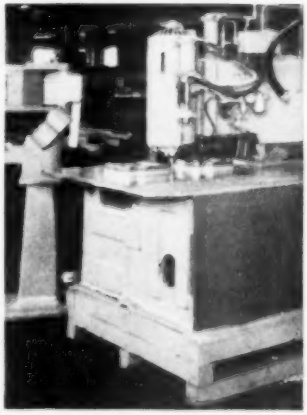
Coolant is directed to the cutter as a mist, completely enveloping it. The solenoid valve controlling the coolant supply is electrically interlocked with machine start-stop button. The standard set back or offset between templet and the edge of the work when cutting is 7/32 in.

Motor is single-winding, air-cooled with 30 hp for operation on 3-phase, 440-v, 240-cycle line to provide a spindle speed of 14,400 rpm.

Machine Operation

Assuming that a square opening is going to be cut in aluminum, the head would be moved into position by depressing the rapid-traverse button and the required directional button. Since its an inside cut, the selector switch would be turned to that position.

When the down button is pushed the cutter would plunge into the material. Assuming that the cutter entered the material near the line of cut, closest to the operator, the direction of travel would then be to the right, and this would be accomplished by depressing button No. 2. Upon reaching the first right angle turn, button No. 1 would be engaged. When the next right angle turn is reached, button No. 4 would be engaged; then No. 3 and No. 2 to com-

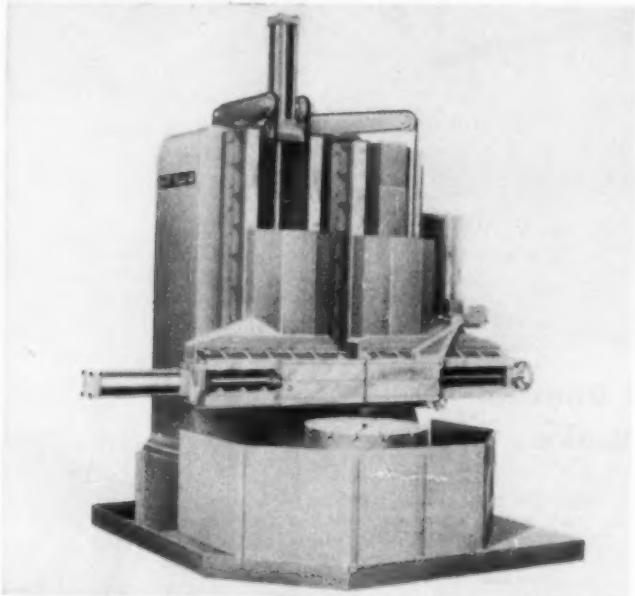


Remote-control station includes: (1) A run button to energize the hydraulic-electric circuit; (2) A master stop button; (3) Two buttons to control head feed (4) Two buttons to vary feed speed of arms; (5) A selector switch for internal and external routing (6) Selector switch marked "Right" and "Left" for controlling the arms when working the right or left of table center line; (7) A four-directional push-button control plate with a fifth button centrally located in the plate to provide rapid arm traverse when positioning

Materials and Parts

plete the cut. The cutter would then be slightly backed off by depressing button No. 1, after which the up button, controlling the head, would be depressed and the cutter would be removed from the material.

Ekstrom, Carlson & Co, 1400 Railroad Ave, Rockford, Ill.



Hydraulic Cylinders Operate Slide On Vertical Contouring Machine

The Style 426-A does precision contouring, boring, turning, facing, grooving and rabbeting on large round parts such as jet-engine compressor wheels. Simple controls and automatic functions make it possible for an unskilled operator to do accurate production work.

A tracer carried on the horizontal member of the right-hand compound slide controls both vertical and horizontal movements when contouring. The tracer finger follows the form on a hardened-and-ground flat steel templet.

Both vertical and horizontal members of the contouring slide are operated through ground leadscrews driven by individual variable-speed motors. Through the electronic control, the adjusted feed per revolution remains constant throughout the cut regardless of variations in the contour or table speed.

The left-hand compound slide consists of a vertical slide supporting a horizontal toolslide, both of which are operated by large hydraulic cylinders. The vertical slide provides feeds for turning, boring, and rabbeting, while such operations as facing and grooving are done during the feed stroke of the horizontal slide. Seven different automatic cycles are possible with the left-hand compound slide.

The normal machine cycle includes operation of both compound slides in sequence, either operating first. All slideways are lubricated automatically.

A large table supported on a vertical work spindle simplifies loading and unloading.

Ex-Cell-O Corp, 1200 Oakman Blvd, Detroit 32, Mich

... INCLUDING

Press brake has 14 6-in. air cylinders to operate draw rings, knockout bars, etc. page 184

Pantograph engraving machine marks rolls up to 36 in. dia by 12 ft long that have been heat-treated to R. 50 page 186

Rolling quench machine holds and quenches long shafted parts without distorting them page 188

Lightweight X-ray unit has a protruding snout for taking interior pictures page 192

Circular cut-off-tool has all but the cutting edge protected by a shroud —increasing tool rigidity by reducing overhang page 194

Indexable lathe tool uses same blades as those in the co.'s milling cutters page 196

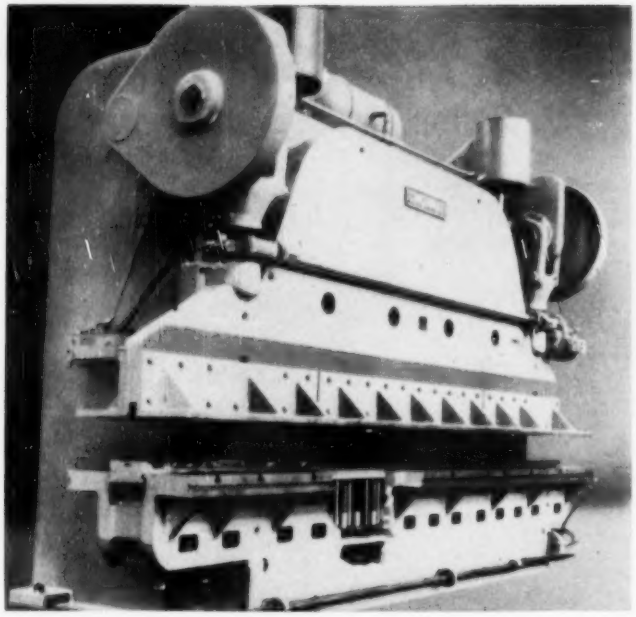
Vertical miller has cross-movement of the cutter by a handwheel with graduated collar page 198

New Bulletins for Your Shop Library, including a 24-page booklet on plain and universal grinders.....pages 189 and 190

... and in Dec. 8

Automatic boring unit has feed mechanism operated by hydraulic pump and fluid motor

Sine chuck simplifies angular surface-grinding by using standard gage blocks



Shallow Draw Work Done On Cincinnati Press Brake

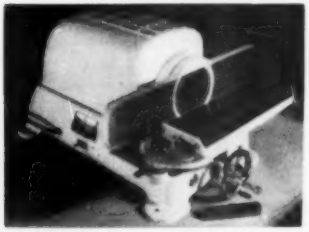
This press brake has a double plate bed, 30 in. wide, and 15 ft 8 in. in over-all length. There are 14 six-inch air cylinders mounted between plates for operating draw rings, knockout bars, and similar units.

The machine weighs 72,000 lb., has a speed of 23 spm, and has removable ram angles for press or brake operation. Other features include air counterbalances and horns on each end of the bed and ram.

Cincinnati Shaper Co, Hopple, Garrard & Elam Sts, Cincinnati 25, Ohio

Steel, plain and alloy, can be cut, also all non-ferrous metals and brittle materials such as cast iron, plastics.

National Threading Machine Co, 126 Market St, Paterson, NJ



Southwest Hand Grinder

Here's a simple method of grinding flat and square surfaces by hand. A 5-in. cup wheel protrudes slightly through the stationary fence along which the work is moved. Its uses include facing flat valves, straight-edge knives, connecting rod caps, small dies, and numerous castings.

Fence dimensions are: 3¼ in. high, 4½ in. wide, and 18 in. long. Net weight is 216 lb.

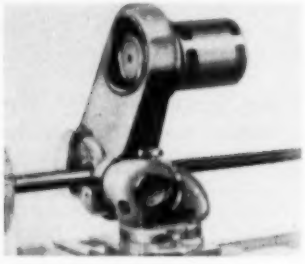
Southwest Machine Works, 1309 Bridge St, Albuquerque, New Mexico

Indicator Snap Gage Checks Splined Shafts

The gage has a straight-sided rack tooth or a cylindrical section representing a measuring wire on the bottom and top jaws. The top jaw is movable and actuates the dial cushion movement indicator which is calibrated in increments of 0.0001 in. A thumb-operated button lifts the upper jaw, permitting the gage to be placed over the splined shaft that is to be inspected.

Only the actual tooth thickness is checked, at or near the pitch diameter. These gages are set to masters, and have a size range of from 0.0 in. up to and including 8.0 in.

Vinco Corp, 9111 Schaefer Highway, Detroit 28, Mich



Tool Whirls Around Work Eccentrically to Produce Threads

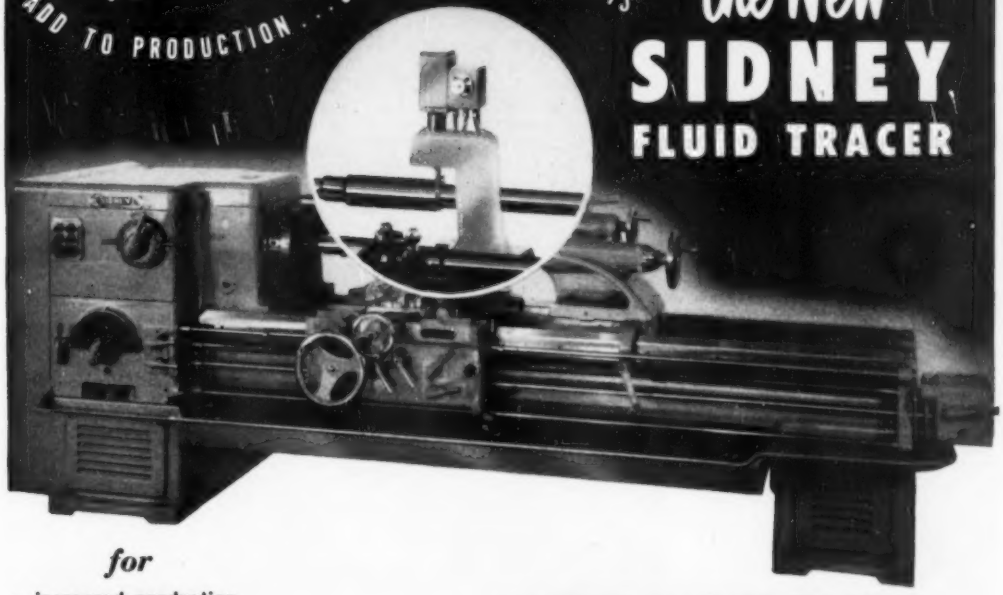
A thread-cutting and worm-cutting machine, when installed on a standard lathe, is said to ncrease speed by nine times over that of lathe cutting and two times as compared with thread milling. The actual cutting is done by means of a tool which moves around the workpiece eccentrically at high speed, in a single continuous operation.

The unit cuts long standard V threads, Acme, buttress and rounded threads, and, within close limits, modified square threads. They are said to be more exact in pitch than those produced under equal machining conditions on a twining basis. One reason for this is that there is no torsion of the work. Also it is claimed that tearing of the flanks, smearing of the work, and built-up edges are eliminated. All flanks, even in soft steel or aluminum, show a high polish. Cutting speeds are between 800 to 2000 fpm, depending on material worked.

Sufficient air passes the tool in its path to keep it cool, although in producing guide or measuring spindles with exact pitch, cooling of the work is sometimes necessary.

NOW... the New SIDNEY FLUID TRACER

ADD TO PRODUCTION . . . SUBTRACT FROM COSTS



for

- increased production
- greater versatility
- wider range of work
- LOWER COSTS

Here's an all-hydraulic controlled tracer with a DUAL PURPOSE . . . for tracing from round or flat template and regular lathe work with unlimited range for both.

Note how simple: just position one lever on clutch and brake unit to engage or disengage the tracer . . . that's all. No loss of time, no extra space, no parts to bother with, no extra expense for a single-purpose tool.

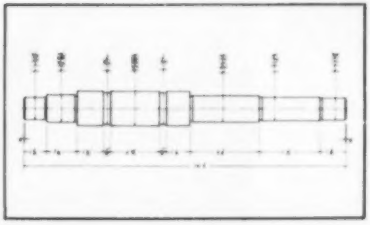
ABSOLUTELY SAME PRECISION ACCURACY AS WITH ALL SIDNEY PRODUCTS. Contour changes of the master piece are transmitted through the ultra-sensitive tracer valve as magically as if by an "electric eye" . . . even sharp shoulders are faced to amazingly close limits.

ADD the Sidney Fluid Tracer to any Sidney Model 32 Lathe. You'll enjoy the savings and efficiency of

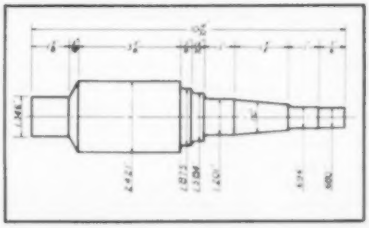
THE FINEST TURNING TOOL EVER PRODUCED

Please write for detailed literature or contact your nearest Sidney representative.

AMAZING SAVINGS THROUGH SIDNEY TURNING TIME

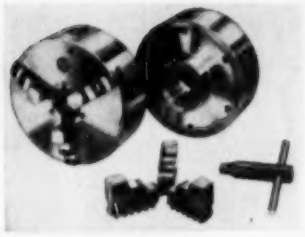


Normal Turning Time
4 hrs. 33 min.
SIDNEY TURNING TIME
38 min.
YOU SAVE
3 hrs. 55 min.



Normal Turning Time
25 min.
SIDNEY TURNING TIME
2 min. 31 sec.
YOU SAVE
22 min. 29 sec.

The SIDNEY MACHINE TOOL Company
Builders of Precision Machinery
SIDNEY ESTABLISHED 1904 OHIO

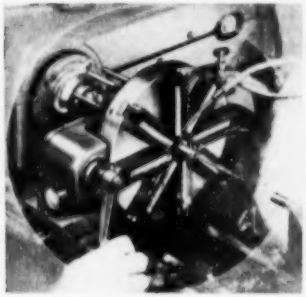


Three-Jaw Universal Chuck

The No. 6907 6-in., 3-jaw universal chuck with threaded body back for direct mounting on lathes, milling machines, grinders, and other machine tools with 2¼-in. 8 spindles.

Since no adapter is required, the chuck is mounted close to the spindle bearing, thus minimizing chatter which may be caused by excessive overhang.

Westcott Chuck Co, Oneida, NY



Rotating 8-Tool Head For Small Engine Lathes

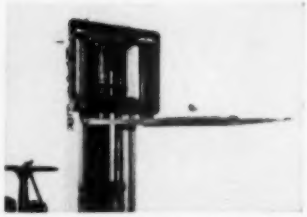
The Roto Head uses the principle of Swiss automatic machines—it possesses 8 different single-point tools mounted in slidable, spring-loaded toolholders. The holders are equally spaced around the face of a rotating head, each tool pointing toward the lathe axis. The head is mounted on a cross-slide dovetail, replacing the conventional cross-slide. It will fit any engine lathe between 9- and 12-in. swing.

Tool infeed is actuated individually by rotating a hand crank. A cam attached to the crank advances the tool to its full cutting depth by contacting either of two buttons behind the toolslide. Each button has a micrometer adjustment. Two diameters are thus possible for each cutting bit. As the crank continues to rotate, the head automatically indexes to the next station, the cutting cycle repeating successively with each toolslide. By varying setups of the different bits, up to 16 different diameters can be produced on one job.

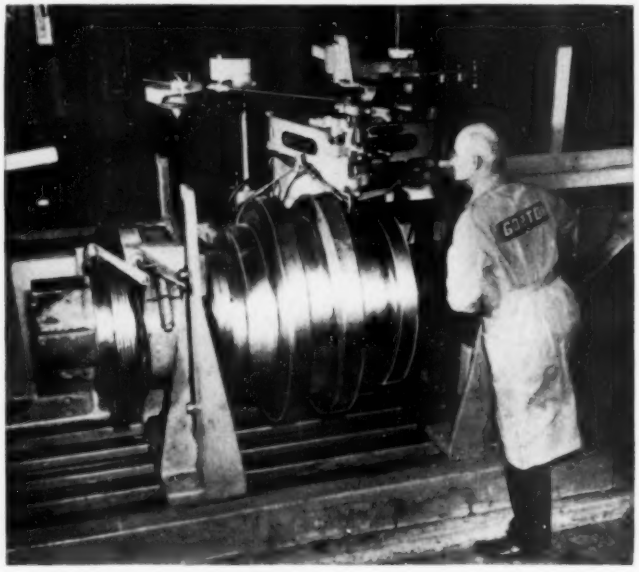
All longitudinal feeds are made by conventional carriage travel. Stops at each station automatically index and limit longitudinal feeds, permitting a total of 23 shoulder lengths and cut off. Work is supported at the tool point by three universally adjustable rollers.

No center drilling of work is required, no tail-stock support is needed. Work can be machined from full-length bar stock to close tolerances, held to desired concentricity and cut-off in a simple series of crank rotations and manual longitudinal cuts.

General Roto Co, 8914 Melrose Ave, Los Angeles 46, Calif



FREE-LIFT UPRIGHTS for Hyster Model 20 lift truck is for applications where there is a minimum overhead clearance, and where the inner upright of a standard model would strike obstructions before the load could be elevated to the desired height. The uprights are available in 7 ft. 8 in., and 9 ft. 8 in. lift heights. — *Hyster Co, 2902 N E Clackamas St, Portland 8, Oregon*



PANTOGRAPH ENGRAVING MACHINE mills and engraves the surface of rolls up to 36 in. dia by 12 ft long which have been heat-treated to 50 Rockwell C. The roll shafts at either end are cradled on two free-running rollers; an indexing ring attached to one end of the shaft is operated by handcrank with worm and worm gear ring to turn the roll to any desired position. The large bed casting contains an accurate keyway running the entire length of the bed in the center. This is used to position the two workholding brackets. On either side of this keyway there is a T-slot for use in clamping the two U-shaped workholding brackets, one at each end of the roll shaft. An elevating screw under each cross member is used to position the roll vertically and to provide support during use. A heavily ribbed solid rail with a scraped dovetail way on top is bolted to the rear edge of the base. A two-dimensional pantograph mechanism is attached and slides along this dovetail way from one end to the other of the rail. This movement is effected by a large handwheel and a rack and pinion located under the rear edge of the rail. Transverse movement of the pantograph is also on scraped dovetail ways. Engraving on the curved surfaces can be done using flat copy or master patterns — *George Gorton Machine Company, Racine, Wisconsin*

Get the most out of your

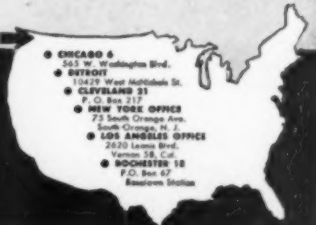
LELAND-GIFFORD DRILLING MACHINES

Avoid Excess Tension on Spindle Return Spring

Excessive tension on the return spring contributes nothing to faster production . . . results only in unnecessary abuse of a fine piece of precision equipment. Spindle return is readily adjustable for speed and sensitivity. Correct tension will help to insure the long life and satisfactory performance built into your Leland-Gifford Drilling Machines.

A small point? Yes . . . but important! Leland-Gifford Drilling Machines are built as trouble-free as master craftsmanship and long experience can make them . . . with totally enclosed motors, spline lubrication wipers, oil mist lubricated spindle bearings and many other features to insure lasting precision and safe, dependable operation. But neglect or abuse can impair the performance of even the finest equipment. With reasonable care and maintenance, your Leland-Gifford Drilling Machines will keep on producing accurate holes year after year. Remember, you are making a valuable contribution to the defense effort when you take the best possible care of your production equipment.

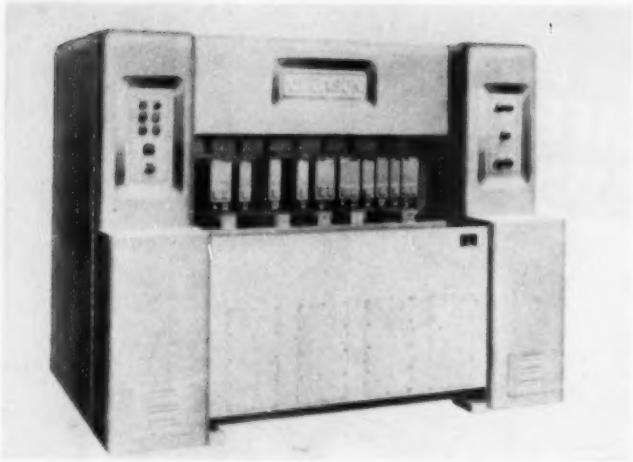
SAVE TIME **— CONTACT THE OFFICE NEAREST YOU**



LELAND-GIFFORD

Drilling Machines

WORCESTER 1, MASSACHUSETTS, U.S.A.



Gleason Rolling Quench Machine Provides Automatic Straightening

The Gleason rolling quench machine holds and quenches heated shafted parts so that they may be hardened with a minimum of distortion.

The hot part is placed on the lower rollers and the start buttons depressed until the quench cycle starts. From this point on the operation is automatic. The upper roller holds the part, forcing it against the lower rollers. Some of the lower rollers are rotating and when pressure is applied the part is rotated in a quenching medium for a predetermined time.

Upon completion of the quench, the guard, upper rollers, and roller brackets rise. The part may then be removed by the operator.

Some of the machine's features are:

(1) Automatic straightening—rollers hold the part straight and concentric while it rotates throughout the quench. This eliminates the straightening of the part after quenching.

(2) Controlled force quench—assuring uniformity of hardness and minimum of distortion.

(3) Controlled pressures—preset clamping and roller pressure are used during the quench.

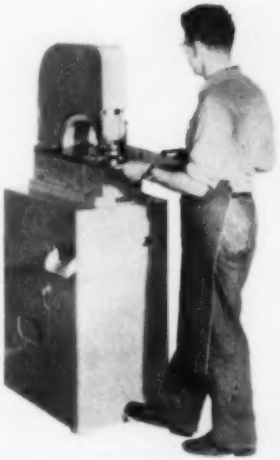
(4) A built-in pumping system and a quenching fluid reservoir reduce the external supply required to an average of 25 gal. per min., while providing flow as high as 250 gpm.

(5) Safe, quick-loading.

(6) Multiple quenching may be employed for parts that are short in length and quenched simultaneously.

The machine will handle shafts 9/16 in. to 4 in. in dia, 6 in. to 43 in. long.

Gleason Works, 1000 University Ave, Rochester, NY



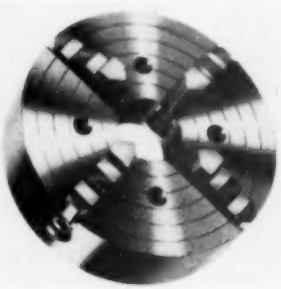
5-Ton Power Punch Presses Have Deep Throat

Called Di-Acro Power Punch Presses No. 1 and No. 2, they feature a deep throat. Because of this, many operations can be performed on them that could not be done on shallow, bench presses. They will punch a 4-in. dia hole in 16-gage sheet steel ,or a $\frac{3}{8}$-in. hole in 3/16-in. steel plate.

Features of these presses include: (1) 180 spm; (2) simple operation—foot control frees both of the operator's hands for work handling and positioning; (3) safety—all moving parts are housed in a welded steel cabinet; (4) quick setup—complete line of punches and dies are available and change-over is simple; (5) floor space required is only 17x28 in.; (6) portable—need not be bolted down; net weight of No. 1 model is 540 lb, No. 2 is 715 lb; (7) material chute—built into cabinet for slugs and blanked parts.

The flywheel is driven by a ½-hp electric motor. Choice of single phase, 110-220 v, or a three-phase 220-440 v, ac motor.

O'Neil-Irwin Mfg Co, 512 Eighth Ave, Lake City, Minn



Buck Independent Chuck Eliminates Excessive Overhang

This 4-jaw Independent chuck is said to be the first built around the spindle and not beyond it, thus eliminating excessive overhang. They are especially for lathes from 9 to 16 in.

Gripping is accomplished by an operating screw which is ⅛ in. larger in diameter than usual. The screw has a 9-pitch Acme thread which makes for finer adjusting and quicker, easier centering of the work.

Buck Tool Company, 2015 Schippers Lane, Kalamazoo 62, Mich

Lightweight air hoists (a 1000-lb capacity unit weighs only 30 lb) have been improved: safety hooks are now standard equipment for load hook and optional for suspension hook; improved lubrication system; an extra bearing has been added to the motor drive shaft; ring gears hardened for longer wear.

Keller Tool Co, Grand Haven, Mich.

FYI

FOR YOUR INFORMATION

FREE Catalogs, Booklets, Charts, Calculators

FYI—these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail. We'll do the rest.

MACHINES AND ATTACHMENTS

1 POWER HACKSAW—*Sales Service Machine Tool Co, St Paul, Minn.* 4-page folder 3053 describes line of Kalamazoo, including two new models with variable-pressure feed control. Specifications on ten models included.

2 PRESS—*Clearing Machine Corp, Chicago, Ill.* 4-page bulletin 319 lists features of double end horizontal hydraulic unit.

3 MILLING MACHINE—*General Machine Works, Inc, Chicago, Ill.* 4-page bulletin 1130 describes unit for milling aluminum and non-ferrous alloys at rate of 2½ cu in. per min. per hp. Features, including high-speed table feeds, illustrated.

4 MACHINE TOOLS — *South Bend Lathe Works, South Bend, Ind.* 16-page catalog 5246 describes complete line of lathes, drillpresses, bench shapers, and accessories. Illustrations and specifications included.

5 PRESSES — *Famco Machine Co, Kenosha, Wis.* 6-page catalog illustrates features of line of air, arbor, drill, foot, and power presses, bead saws, and squaring shears. Specifications listed.

6 GRINDER—*Sheets Lathe & Grinder, Inc, Boston, Mass.* 8-page bulletin 84A illustrates small-hole unit which operates as internal or external grinder, and may be equipped for cylindrical work.

7 HYDRAULIC PRESSES—*Lake Erie Engrg Corp, Buffalo, NY.* 7-page bulletin describes line of forming and bending presses. Construction features, applications, and specifications included.

8 PRECISION GRINDERS — *Landis Tool Co, Waynesboro, Pa.* 24-page catalog illustrates line of universal and plain grinders, and single-purpose, high-production units. Includes features and specifications.

TOOLS AND ACCESSORIES

9 CARBIDE-TIPPED SAW — *North American Products Co, Milwaukee, Wis.* Bulletin lists features of unit for high speed cut-off and milling machines. Suggested feeds and speeds, and applications included.

10 GRAVITY FEED OILERS—*Oil-Rite Corp, Manitowoc, Wis.* Bulletin 61-11 describes line of large-capacity oilers with range of 8 oz to 1 gal; ¼- to 3-in mats covered in bulletin 61-L.

11 DIAMOND LAPPING COMPOUND —*J K Smit & Sons, Murray Hill, NJ.* 7-color brochure covers compound known as Mirro-Lap. Photos show applications. Table included illustrates variety of grades in their actual color, prices and uses for each.

12 OILERS—*Synco-Dubin Co, Detroit 27, Mich.* 20-page catalog contains illustrated engineering data on MT-Cor and standard units, vents, caps, special tube forms, etc.

13 PILOT BEARING BUSHINGS—*J G Jergens Co, Cleveland, Ohio.* 4-page catalog provides cut-away illustrations, applications, dimension sketches, and specification tables on new unit providing chuck and against contacts, free pendant dust and grit.

14 OPTICAL INSTRUMENTS—*Bausch & Lomb Optical Co, Rochester, NY.* 8-page catalog D-27 lists functions and applications of seven types of instruments to aid production and quality control. Technical data and drawings included.

15 GRINDING WHEELS — *Cincinnati Milling Machine Co, Cincinnati, Ohio.* 36-page illustrated catalog contains extensive data on Rex, available from 12 in. dia, and larger.

16 CARBIDE TOOLS — *DoAll Co, Des Plaines, Ill.* 12-page catalog 52-217 provides information on single-point cutting tools and carbide tips and blanks. Grades are listed and applications indicated. Data on proper use included, as well as complete ordering information.

17 PERMANENT MAGNET SEPARATORS—*S G Frantz Co, Trenton 4, NJ.* 4-page folder on force-flows for extraction of particles and chips from lubricating and hydraulic oils, coolants, and

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Company	
Co. Address	
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Co. Address	
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EYI

cutting compounds. Specifications and illustrated applications included.

HEAT-TREATING AND WELDING

18 ARC WELDERS—*Robert Brothers Co. Troy, Ohio.* 8-page folder illustrates and describes complete line of gasoline-engine-driven units. Specification guide for welders and combination model of welder and power unit.

19 ALLOY AND FLUX WALL CHART —*All-State Welding Alloys Co. White Plains, N.Y.* 18x27-in. wall chart provides data on 41 alloys and appropriate flames for accurate selection for specific job.

20 INDUCTION HEATERS — *Magnethermic Corp. Youngstown, Ohio.* 8-page bulletin on 60-cycle low-frequency units for forging, annealing, rolling, etc. Illustrated data includes rating and dimension tables.

21 ELECTRODES — *Alloy Rods Co. York, Pa.* 4-page bulletin ARS-2210 covers line of Nickel-Arc-66 units for cast-iron welding. Illustrations and recommended procedures included.

PLANT-SERVICE EQUIPMENT

22 SCRAP REMOVAL CONVEYOR — *Mac-Fran Enors Co. Cleveland 10, Ohio.* 4-page illustrated bulletin MF-445 describes and illustrates the Chip-Tote unit, adaptable to any automatic or multiple-spindle machine. Operation and features detailed.

23 HEAT-RESISTANT GLOVES — *Mine Safety Appliances Co. Pittsburgh 8, Pa.* Bulletin describes Comfolo, all-leather gloves, heat-resistant to 500 F. Details, including prices, included.

24 INDUSTRIAL LIGHTING — *IES Standards Institute. Chicago 6, Ill.* 46-page 1952 edition of IES standard specifications for industrial lighting contains detailed data for 18 incandescent and fluorescent units. Manual includes tables and technical data.

25 STORAGE EQUIPMENT — *Precision Equipment Co. Chicago 51, Ill.* 31-page illustrated catalog features steel shelving, lockers, and maintenance equipment. Prices included.

26 INDUSTRIAL TRUCKS — *Lewis-Shepard Products, Watertown, Mass.* 4-page illustrated circular covers new Spacemaster model M, high- and low-lift stacker. Specifications and dimensional drawings included.

27 COPYING MACHINE — *Charles Bruning Co. Inc. Teterboro, N.J.* 7-page booklet describes model 14 Copyflex unit for handling production control systems, inventory records, etc. Features and applications listed.

28 DEHYDRATORS — *Sales Corp. of America. Philadelphia, Pa.* 12-page bulletin describes three series of units, specified as to capacities and dimensions, for continuous removal of water vapor from air and other gases to dewpoints as low as —100 F.

29 MATERIALS HANDLING EQUIPMENT MANUAL—*Caster & Floor Truck Mfrs' Association, Chicago 6, Ill.* 48-page illustrated handbook contains extensive data on wheels, casters, trucks, trailers, pallets and skids. Specifications and background information supplied.

PARTS AND MATERIALS

30 SPEED CHANGERS — *Motron Instrument Co, Denver 9, Col.* 4-page bulletin 100 describes miniature fixed-ratio units for fixed-ratio gearing problems in instruments, controls, servomechanisms, and all low-power devices. Two series available in over 400 ratios.

31 X-RAY SUPPLIES—*Kelsbot X-Ray Corp, Covington, Ky.* 104-page illustrated catalog of accessories and supplies essential to radiography. Items covered range from stirring rod to lead building blocks.

32 METAL HOSE AND TUBING — *American Brass Co, Metal Hose Branch, Waterbury 20, Conn.* 16-page illustrated catalog CC-400 describes seamless and strip-wound types. Ranges of available alloys and sizes, suggested applications, and engineering information included.

33 CENTRIFUGAL PUMPS — *Allis-Chalmers Mfg Co, Milwaukee, Wis.* 4-page bulletin 22B6481A contains engineering information on frame-type units for handling work requiring capacities up to 500 gpm. Cross-section diagrams of three available types included.

34 LOCK NUTS—*Palnut Co, Irvington 11, N.J.* 8-page bulletin 571 describes nuts for heavy assemblies and severe vibration. Outlines features, applications, assembly methods, and other engineering information.

35 ROLLER BEARINGS—*Norma Bearing Co, Belleville, N.J.* 16-page catalog 552 offers description and specifications of bearing selection for variety of uses. Data on load/speed factor, stationary shaft, and bearing life with shaft and housing limits included.

36 AIR CYLINDERS—*Lindberg Engrg Co, Chicago 18, Ill.* 12-page booklet 701 describes and illustrates complete line. Diagrams, and charts explain capacity, type of mounting, etc. Engineering features included.

37 FLOATING-DISK CLUTCHES — *Curtis Johnson Machine Co, Manchester, Conn.* 20-page 1952 catalog contains specifications, diagrams and information on eight sizes of standard Marlberg clutches, capacities from ¼ to 15 hp, 100 rpm. Specifications on additional units included.

MISCELLANEOUS

38 SURFACE ROUGHNESS — *Microcentrical Mfg Co. Ann Arbor, Mich.* 4-page illustrated folder 1-51 provides information on roughness as applied to machined and finished surfaces, describes advantages of specifications of parts, and how to specify microinch roughness on working drawings.

39 SHEET AND PLATE FABRICATION—*Kirk & Blum Mfg Co, Cincinnati 8, Ohio.* 48-page illustrated brochure of manufacturing facilities plus extensive view of typical parts and products, including breechblocks and casings, guards, plating equipment, etc.

40 METAL STAMPINGS—*The Crosby Co. Buffalo 5, N.Y.* 14-page illustrated book presents analyses of 13 stamped parts and fabricated assemblies as examples of company facilities. Summary of diversified equipment available is included.

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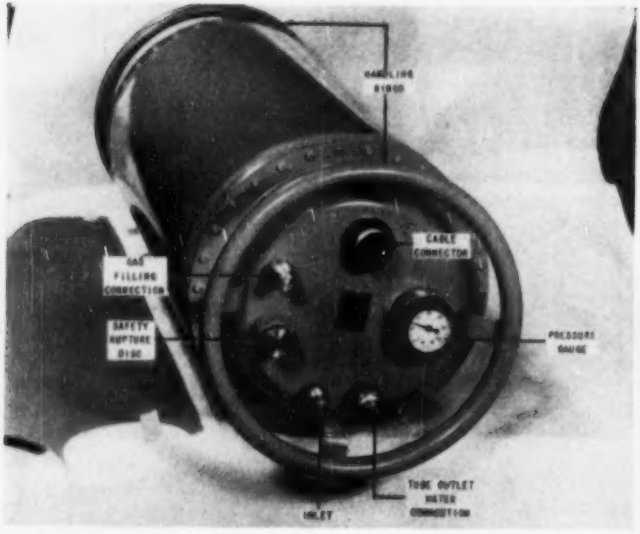


Lightweight Unit X-Rays Steel 3½ in. in Thickness

This 250,000-v X-ray machine, capable of operation on steel up to 3½ in. in thickness, is less than 15 in. in dia, and measures 44 in. in length. It weighs 150 lb, as against 1150 for conventional units.

Feature of its versatility is a protruding snout from which rays are emitted, which facilitates taking of interior X-ray pictures. Operator can insert unit inside a pipe for inspection of a weld joint connecting two sections; position can be changed for each exposure area without disturbing pipe.

Operating within a range of 75,000 to 250,000 v, the unit can be used on anything from magnesium to steel. Use on light metals is aided by the beryllium window of the X-ray tube, which allows the escape of softer, less penetrating X-rays from the tube.

General Electric, 4855 Electric Ave, Milwaukee 14, Wis.

Cutter-Grinder Fixture Is Easily Loaded, Changed Over

Developed to handle a wide variety of work—countersinks of all types, center drills, integral pilot cutters, and right- or left-hand pilot drills, the I-G-C relief grinder is both fast and accurate, and does not require a highly skilled operator. With only two wrenches, the fixture is easily adjusted for the correct relief and angle in relation to the wheel.

It will handle work from 1/16 to 1 in. dia with standard collets. The lift of the single cam is variable from 0.001 in. to ⅛ in., and cam adjustment pins are provided for 1, 2, 3, 4 and 6-fluted cutter grinding. The fixture swings 90° to the right or left; base is calibrated in 5° increments.

By a quick change of collets, angle of fixture, and the left cam, the fixture is easily set up for various grinding operations. Cutting edges are ground equally.

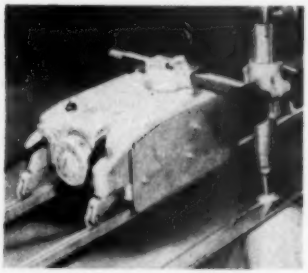
Loading of the fixture is done in three simple steps: (1) correct-size collet is inserted; (2) work is placed in the collet and locked in position with the handwheel; (3) handwheel is turned to rotate work against the wheel. A locking pin holds the spindle rigid while the collet and work are being tightened.

Industrial Grinding Co, 1600 W Magnolia Blvd, Burbank, Calif.

Turned and Bored Bar Sections Made of Graph-Mo Tool Steel

This Timken product has the advantages of graphitic tool steel plus the convenience of a hollow-bar section in manufacturing ring gages, dies, and other annular tool-steel parts. Stock sizes will range from 4 to 16 in. outside dia with a variety of wall thicknesses.

Steel and Tube Div, The Timken Roller Bearing Co, Canton 6, Ohio.



Portable Machine Carriage to Cut, Weld, and Flame-Treat

The Oxweld CM-45 weighs only 33¼ lb complete with blow pipe, so it can be moved easily from one job to another. Because of its compactness, it can also be employed in close quarters where larger machines cannot be used.

It is housed in a one-piece aluminum casting, and is powered by a heavy-duty electrically reversible motor. A centrifugal governor covers a stepless speed range of 4 to 32 ipm. Other speeds are possible if special motor gearheads are used. A simple gearing system and mechanical clutch permit disengaging the gears for free-wheeling.

Operating controls consist of a three-position motor switch, a speed-control dial that can be preset or instantly adjusted during operation, a two-position clutch lever. Starting, stopping, and reversing can be handled by a single control when the clutch is engaged.

Bevels can be cut at practically any angle—top or bottom—either in straight lines or circles. The blow-pipe can be set at the desired bevel angle by means of adjusting pivot that has a calibrated indicator dial. Circles with diameters of from 2 to 54 in. can be cut. Flame-treating jobs, such as low-temperature stress-relieving, flame-hardening, and flame-softening can be done with suitable apparatus.

Linde Air Products Co, Div of Union Carbide & Carbon Corp, 30 E 42nd St, New York 17, N Y.

ASSEMBLE AND INSPECT UNDER MAGNIFICATION *in one operation...*

with the Kodak Contour Projector

This starter switch for a refrigerator motor presents a tough assembly and inspection problem. The springs must be accurately bent and adjusted by hand—tolerances are close.

With the Kodak Contour Projector the whole operation—bending and checking—may be done at the same time and under the magnification that's most convenient.

Since the Kodak Contour Projector has provisions for surface illumination from the same lens that picks up the image, every detail of the switch is shown on the screen. A 45° mirror permits the part to be mounted flat for easy accessibility. Both to adjust the part and check tolerances, the operator simply compares the magnified image with a chart-gage laid on the bright screen.

Whether your interest is in large parts or small parts, simple parts or complex parts with many dimensions, a Kodak Contour Projector will do the job quickly, completely, and accurately. The operator can work in a lighted room unhampered by hoods or curtains. And little training is required to get the work out in a hurry.

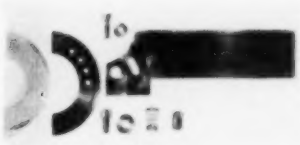
For rapid, routine inspection and adjustment work, the economical, stripped-down Kodak Contour Projector, Model 3, will meet your requirements. For toolroom measurement, the versatile Model 2A is what you need. In your area there is an experienced field engineer who will be glad to discuss your own particular problems. You can get in touch with him by writing Eastman Kodak Company, Industrial Optical Sales Division, Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

Optical Gaging

A new sound movie shows how to simplify complex inspection problems. We'll tell you how to get it for a showing.

Kodak



Circular Cut-Off Tool Has Cutting Surface in Periphery

Cut-off tool is a semi-circular disc of HSS with the cutting surface in the periphery, similar to what would result were it possible to take a conventional straight cut-off tool and bend it into a half-round with its cutting edge on the outer dia.

The blade is mounted in a holder as shown in the illustration, with all but the necessary cutting edge protected by an envelope or shroud. The tool is so ground that when the lead, or cutting edge of the tool, is in the same plane as the front of the holder, it is properly positioned. The toolholder is accurately located in the machine so that the cutting edge of the tool is in the spindle center line. It can be substituted for straight-blade holder in most screw machines up to 1⅝-in. capacity.

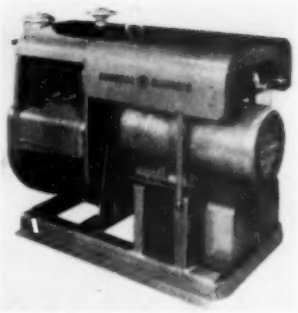
In design, the profile of the Cir-Cut tool differs little from conventional blades. The top, or periphery, of the tool is hollow ground to collapse the chip and lessen heat generation from chip flow on the edges of the tool. Side clearances are ground in the blade during manufacture and remain constant throughout the life of the blade. The front clearance angle is ground in the blade prior to shipment and to facilitate grinding, guide lines are stamped on the sides of the blades. Top rake is constant—being built into the tool as it is resharpened. Control of chip during the cut is maintained by grinding the shroud, not the tool edge.

Since the tool will, in all probability, be installed on machines already in service, toolholder adapters have been designed to complement the toolholder assembly. These replace the present toolholder adapters and not only assure proper alignment with the spindle but permit a total of 0.090 in. height adjustment to correct for spindle variations. With the toolholder properly positioned on the adapter plate, there is little possibility of anything but flat cuts.

It appears from experience in the field that this tool possesses the following five qualities:

A. Substitutes for straight blades —no conversion problem.
B. Easy to remove and replace in machine—less down-time.
C. Requires no adjustment after grinding—fewer rejects for size variation.
D. Shroud permits minimum tool overhang—greater rigidity, flat cut, no chatter.
E. Thinner blades—major savings in material.

Cir-Cut Div, The New Britain Machine Co, New Britain, Conn.



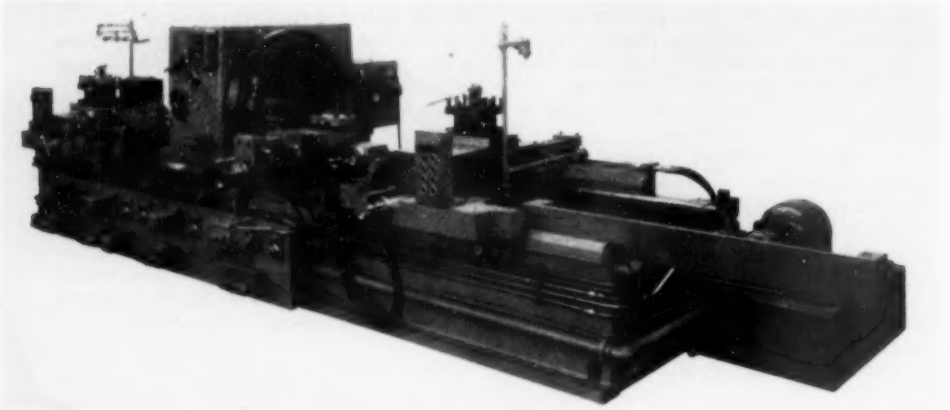
Engine-Driven DC Arc Welder

A 200-a, engine-driven dc arc welder with a 60% duty cycle has been developed by GE. Known as the WD-42AGW, the welder has a current range of 40 to 250 amps, and can be used with a variety of electrode sizes.

It consists of a GE WD42 generator and a Wisconsin air-cooled engine, and is designed to fit crosswise in a standard pickup truck. Optional equipment includes a trailer.

Forced ventilation keeps internal temperature within safety limits when the welder is operated on a 60% duty cycle at rated load. In addition, tests indicate that heavy overloads for short periods do not produce harmful results. A vacuum device saves gasoline by idling the engine when not welding.

General Electric Co, Schenectady 5, N. Y.



HOLLOW-SPINDLE LATHE with 42-in. swing bores, faces, and turns (at one setting) turbine-frame assemblies for jet engines. It maintains dimensional accuracy and relative concentricities and squareness of surfaces difficult to secure when the work has to be reset. The hole in the spindle and chucks is 18 in. and face to face of the chucks is 30½ in. Because of the flexibility of the work, special chucks are provided and segmented bracelets surround the gripping surfaces to avoid distortion in chucking. A total of 16 surfaces are machined, 8 facing, 5 turning, and 3 boring. Hand valve control provides rapid traverse to all slides. Longitudinal feeds are hydraulic with automatic stops. There are 6 spindle speeds from 21 to 100 rpm. — *Lehmann Machine Co, St. Louis, Mo.*

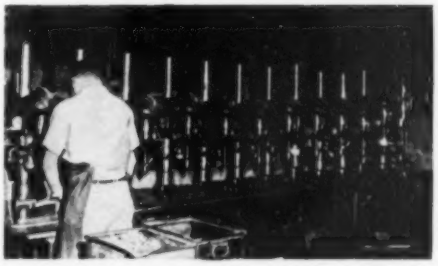
3 Simple "Moves" Show How VERSATILE DELTA TOOLS Solve Production Problems..

1 MOVE THE OPERATOR

To make it easy for the operators of a long-table multiple spindle Delta drill press to move from one work station to another, Albertson and Company, Sioux City, Iowa, devised roller seats that travel on rails. When one man completes his series of operations he passes the work to the next man. Operators can travel the full length of the table with a minimum of fatigue.

2 MOVE THE TOOL

To make easier work of drilling holes in a large, extremely heavy bath-tub casting, Racine Pattern Works, Racine, Wisconsin, mounted a Delta 17-inch drill press on a three-legged spider base, in place of the regular base. Now the casting remains stationary, and it is an easy, simple operation to slide the drill press into several positions for drilling holes in the flange of the casting.



3 MOVE THE WORK

To speed up eleven operations on an aluminum grid casting—including drilling, reaming, counterboring, countersinking—Sangamo Electric Co., Springfield, Ill., uses a Delta 15-foot sectional table and eleven Delta 17-inch drill presses for the individual operations. The casting moves from one machine to the next; and a great deal of costly trucking and handling is eliminated.

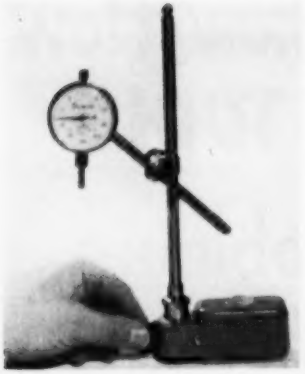
These applications are typical of the cost-cutting set-ups devised by Delta users; and illustrate the extraordinary adaptability of Delta tools to unusual production needs.

There's a Delta Power Tool for Your Job – WOOD OR METAL WORKING

53 MACHINES—246 MODELS—MORE THAN 1300 ACCESSORIES

Your Delta dealer is listed in your Classified Phone Directory under "Tools"

DELTA POWER TOOL DIVISION
Rockwell MANUFACTURING COMPANY
618M N. LEXINGTON AVENUE • PITTSBURGH 8, PA.



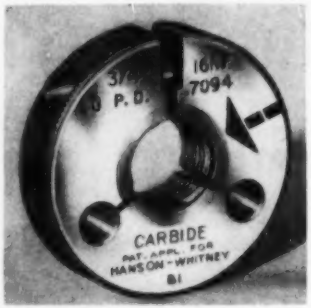
Magnetic-Base Test Set

A strong, 110-lb pull Alnico permanent magnet in the base of this test set, enables the set to be positioned quickly on flat or curved surfaces.

A flick of the finger releases the magnet, and the set can be moved or positioned without jarring the indicator. Three models of the test set are available. Each includes the Geneva magnetic base, a holding rod $\frac{3}{8}$ in. dia by 8 in. long, and a dial indicator with a center lug back 5/16 in. dia by 6 in. long holding rod and knurled screw. Model M-25 has a 125F indicator, with dial graduated to 0.001 in.; Model M-35 has Model 135F, 0.005-in. reading dial indicator; Model M-45 includes the 145F dial indicator, which measures to 0.00001 in.

One model test set is available with an adjustable holding rod which allows $\frac{1}{2}$-in. vertical adjustment. A single knurled thumb nut controls the vernier height adjustment. Without rotating, the holding rod moves vertically for quick setting of the indicator.

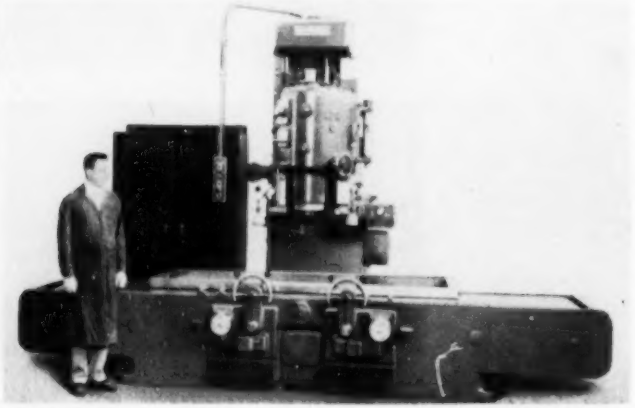
Chicago Dial Indicator Co, Dept D, 180 N Wacker Dr, Chicago, Ill.



Carbide Thread Ring Gages

Because of the hardness and wear resistance of the inserted carbide segments, these rings maintain initial accuracy over long periods of time. They can be reserviced for wear and may be used as master or reference rings. Because of the carbide inserts they are claimed to deliver between 30 and 50 times more inspected parts than regular steel thread rings.

Hanson-Whitney Co, Hartford 2, Conn.



NEW PENDANT CONTROL on the heavy-duty No. 4 Electronic vertical miller provides instant pushbutton control of spindle movement and electronic feed power. The station is particularly useful for spindle jogging when adjusting spindle speed. The miller features electronic feed drive for the table, cross-slide and vertical slide. Feed rates are infinitely variable and the range of feeds is from $\frac{1}{2}$ to 25 ipm. The No. 4 is offered in two sizes—the 60-in. model providing working surface of 24x96 in. and the 96-in. model with working surface of 24x132 in. — *Reed-Prentice Corp, Worcester, Mass.*

Indexable Lathe Tool Has Carbide Cutting Blades

Tool called the Futurblade, utilizes the same blades as used in the company's milling cutters, thus permitting standardization for both milling and turning operations. The tool is claimed to be more rigid than other indexable lathe tools. The entire shank size is beneath the solid carbide cutting blade, and both the latter and the seat on which it rests are finished to gage block flatness. It is claimed the carbide cannot flex or bend under strain.

Another advantage claimed is that no grinding or diamond wheel is necessary unless the user wishes to regrind his own blade. The blade, which is 7/8 in. sq. by 3/16 in. thick, can be indexed eight times and then sent to the Detroit Milling Cutter Co. where it is reground on a special grinder at a cost of less than 19¢ per cutting edge. The $\frac{3}{4}$-in.-sq. x 3/16-in.-thick chipbreaker has extra long life because it is a separate blade, and it can be made of cast-iron, or abrasive-resistant carbide.

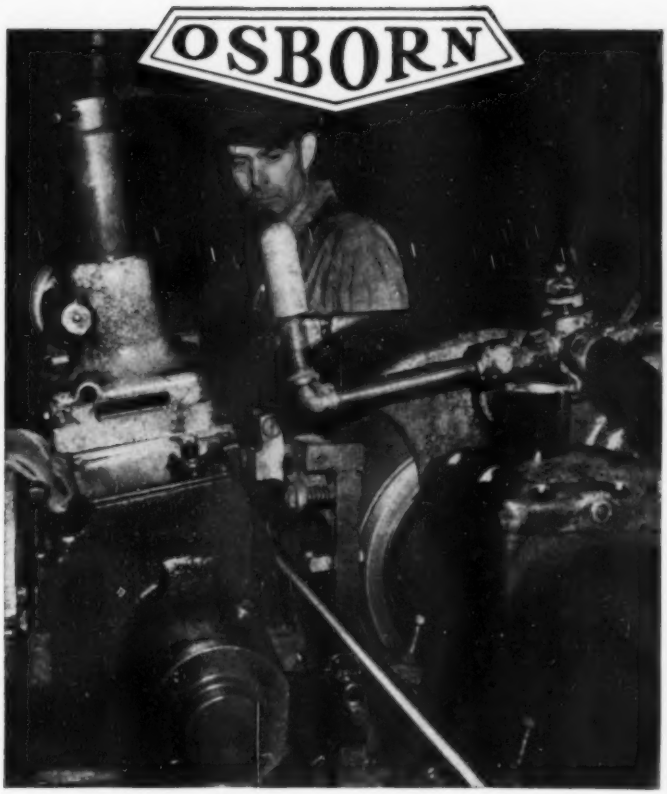
The same toolholder can be used for either turning or facing by merely turning the chip breaker from the side to the front. Adjustments provided include bringing reground blades out frontally or laterally, varying the chip breaker from paralleled to angular, and changing either the end cutting-edge angle or the side cutting-edge angle.

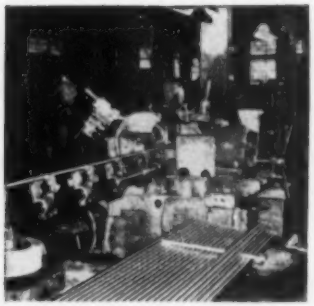
Clearance is provided for the cutting edges by positioning the blade in the holder with double negative rake angles, and for turning and facing into 90° shoulder, a parallelogram blade is furnished to give additional clearances necessary.

Detroit Milling Cutter Co, 28625 Grand River Ave, Farmington, Mich.

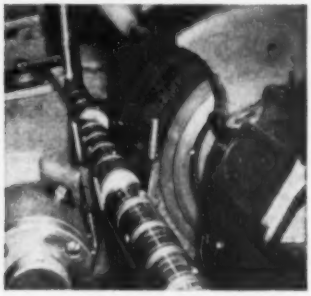
Plastic tote-boxes, called Tew-Roe-Totes, made of copolymer sheeting, are lightweight and resistant to common acids, oils, and greases. Trays and carriers are available in a range of sizes, are chip- and corrosion-proof and not subject to warping.

Tewes-Roedel Plastics Corp, Waukesha, Wis.

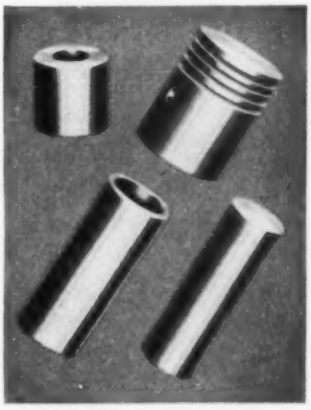




THE SET-UP. This shows the centerless grinding machine which also serves as a "centerless brusher". These pump rods vary from 1¼ in. to 1½ in. diameter . . . from 6 ft. to 36 ft. in length. Regulating wheel speed is 52 r.p.m.



ANOTHER JOB. Here Centerless Brushing finishes cast iron pistons to microsmoothness. Simplifies assembly operations and increases life of pistons and cylinders. Output of this machine is 10,000 pieces per 8 hours.



TYPICAL PARTS which are being improved by Centerless Brushing include pistons, piston pins, bushings, tubing . . . any cylindrical parts. It can be applied to many sizes of parts and types of material on a mass production basis.

Finer finish . . . longer product life with Centerless Brushing

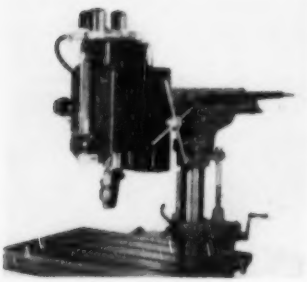
This machine does double duty. For removal of metal to close tolerance, it is a *centerless grinder.* Then, for finishing the surface to microsmoothness it is a *centerless brusher.* Its conversion takes only a few minutes.

In the operation shown above, nickel-moly steel rods for pumps, are being finished by an Osborn Fascut Brush. Prior to brushing, the same machine with a grinding wheel in place of the brush made a rough grind, taking off .006 inch, and a finish grind, taking off .002 inch. Results of the Centerless Brushing: Produces a smoother finish. Reduces wear in pump packing. Reduces corrosive action on rods; makes them last longer.

An **O**sborn **B**rushing **A**nalyst helped develop this improvement. Ask your **OBA** to help *you* on all problems of cleaning and finishing! Call him today or write *The Osborn Manufacturing Company, Dept. 863, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

Osborn Brushes

OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES

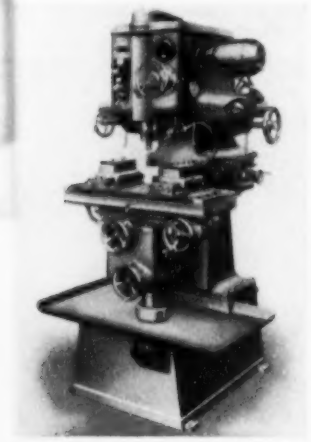


Torque Range Increased to 2760 In.-Lb On Torque Tools

The MA-500 air-driven tool (illustrated) is typical of the higher-capacity power torque units. Because their torque range exceeds the strength of the operator, they need to be mounted.

Like the portable models, the larger stationary tools control torque to within 2% of prescribed limits. There is no need for subsequent hand inspection and scrap is drastically reduced. Tools are available with air-powered, standard or high-cycle electric motors. A built-in reversing system is used on stud drivers. A variety of quick-change wrench attachments is available for nut running, screw driving, and the driving of other fasteners.

Garvin Bros Inc, P O Box 536, South Bend, Ind



Cross Movement of Cutter on Busch Hydraulic Vertical Miller

The large number of traversing movements possible on this machine permit a universal application. It can be used for the automatic milling of keyways, slots, grooves, etc. Because of its finely graduated collars and accuracy, it is also suitable for tool, die, and fixture work.

The cross-movement of the cutting tool is accomplished by a handwheel with a collar graduated to an accuracy of 0.0004 in. This cross-movement makes the width of a keyway independent of cutter dia.

When setting the longitudinal and cross movements of the sliding head and applying an automatic progressive downfeed, the cutter will automatically follow a rectangular movement up to feed capacity of 8x6 in., thus permitting within this range the milling of contours or surfaces to a depth of 4 in. An intermediate vertical adjustment of the table allows a greater milling depth.

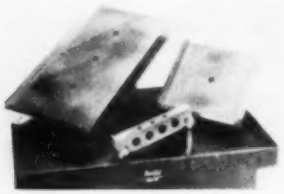
The longitudinal movement of the sliding head works hydraulically, and accurate tripping of this motion is effected by adjustable stops. The speed of the sliding head can be infinitely varied from 0 to 80 ipm. The cross-movement works in a way similar to the longitudinal traverse.

The cutter spindle is case hardened and ground and has an infinitely variable speed ranging from 90 to 4000 rpm.

In addition to the hydraulic movement of the head, the table has hydraulically controlled rapid vertical traverse. It can be raised and lowered hydraulically over a distance of 4 in. and there are longitudinal, cross, and vertical hand movements of the table.

Imported by:

Ernest Gottschalk Co, Inc, 401 Broadway, New York 3, NY



5- and 10-in. Sine Plates Have Large Working Surfaces

These sine plates are available in two sizes, 5 and 10 in. Top area of the 5-in. plate is 6x6 in., top area of the 10-in. plate is 7x12 in.

The large working surfaces enable such jobs as the various degrees of angles of a sine chuck to be accurately checked. Either the 5- or 10-in. plate can be used with a 5-in. sine bar.

Two short cylinders, spaced 5¼-in. apart between centers, are used in place of the single-piece base cylinder commonly employed in sine fixtures. This three-point base provides greater stability and minimizes tipping.

The lapped and serrated working surfaces are held flat and square within 50 millionths on the 5-in. plate and to 75 millionths on the 10-in.

Tapped holes are provided in the side and end of the plates for clamping fixtures. There are also holes for locating dowels or for hold-down screws.

The DoAll Co, Des Plaines, Ill.

Dillon Traction Dynamometer

Traction dynamometer can operate electric warning signals, relays, motors, switches, etc. It can be set for any loading point between 0 and 100,000 lb.

The blue hand provided on the dial is adjustable to any load desired. This holds one of the contacts. As load is imposed, the white pointer moves forward until it reaches the desired point, thereby closing contact with the blue hand.

Lead wires may be connected directly to a power source and thence to the object to be controlled. The dynamometer does not depend upon springs but works upon the principle of deflecting a calibrated beam. It is not affected by extreme temperature changes and is rugged enough to be used as a field instrument.

W C Dillon & Co, 1421 S Circle Ave, Forest Park, Ill.

Screw gage, especially adapted for determining number size for machine and wood screws, will gage all sizes from No. 0 to No. 14 by calibrations on right-hand side of tapered slot. On left-hand side is a graduation by 32nds to determine dias of rods, shafts, etc.; dias varying by 64ths can be determined accurately. Rustproof unit is made of 1/16-in. sheet steel of 2335 specification.

Dayton Rogers Mfg Co, Minneapolis 7, Minn.

Here's Proof

That It Pays to Use SUNNEN HONING on Jobs Like This

Clutch Roller Housing

SUNNEN HONING MACHINES
"Accuracy at Low Cost"

Problem:

To hold tolerance of +.00025", −.00000" on a production job.
MATERIAL: 1020 steel — HARDNESS: Rockwell 60 "C"
HOLE DIAMETER: 1.248" — LENGTH: 1.250"
STOCK REMOVAL: .002"

Solution:

Sunnen Model MBB-1290 Honing Machine, with Sunnen Simplex Honing Tool. Honing machine was delivered and production was under way in less than 6 weeks after original inquiry.

Results:

Smooth, accurate holes well within specifications, at production rate of 50 per hour. Mating parts fit perfectly, *with no selective fitting*. Honed parts improve equipment performance, extend machine life.

Sunnen Honing is showing similar results on hundreds of different parts in leading plants across the country. It's accurate, easy to use, fast—often does the job when nothing else will. On short runs you can often complete the job in less time than it would take to set up for other methods. Average installation costs less than $1,000.00.

HERE'S WHAT THESE VERSATILE MACHINES CAN DO FOR YOU

- Generate geometrically round and straight holes.
- Eliminate grinding in many cases — remove up to .006" and more from hardened steel.
- Produce bearing finishes to 2 RMS in hardened steel.
- Correct out-of-roundness and warpage.
- Eliminate bellmouth and taper in holes.
- Remove burrs and flash from holes.
- Correct heat treat and assembly distortion.
- Hold accuracy to .0001" and better.
- Salvage expensive rejects from other operations.
- Eliminate jigs and fixtures — most jobs can be set up in less than a minute.
- Produce accurate blind holes.
- Size and finish holes with ports, lands, keyways.
- Hone metals, glass, plastics, ceramics.
- Hone diameters from ⅛" to 2⅝".

Send for NEW FREE BOOKLET

Shows you many different ways Sunnen Honing is helping others—suggests ways it might be helpful in *your* plant.

Let SUNNEN HONING Solve Your Hole Problems

SUNNEN PRODUCTS CO. 7925 Manchester Ave., St. Louis 17, Mo.
Canadian Plant: Chatham, Ontario

SUNNEN PRODUCTS COMPANY
7925 Manchester Ave., St. Louis 17, Mo.

☐ Send me FREE Case History Booklet on Sunnen Honing.

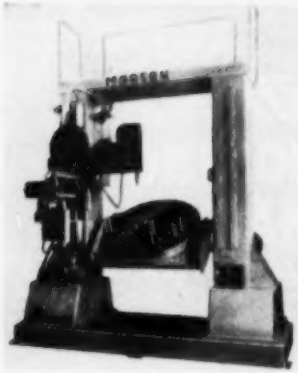
☐ Have a Sunnen Honing Engineer call.

Name .....

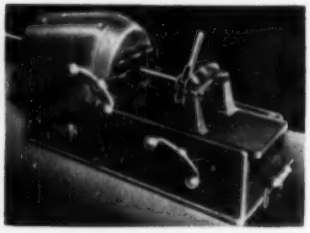
Company .....

Address .....

City ..... Zone ..... State .....



GIRTH-WELDING MACHINE has a tilting table with variable rotation speeds. The columns supporting the table also support the overhead platform for mounting power source and allied equipment. Vertical operation of the saddle is either manual or power driven under operator control. All controls are located on a pendant station. Cross-rail and head mounting block adjustments are made by hand wheels on the saddle. It has 50 in. of vertical saddle adjustment, 11 in. of horizontal cross-rail adjustment, 24 in. of head mounting block adjustment. Table tilt can be 300° with a 20 to 1 table rotation ratio. The table will carry a maximum load of 10 tons, 6 in. eccentric and 6 in. above the table. — *Morton Mfg Co, Muskegon Heights, Mich*



Portable Pipe Threader Has Power-Operated Chucks

The Quijada Chief has a patented power-operated chuck which eliminates the use of wrenches or other manual tools in handling the pipe. A flip of the switch and four jaws, front and rear, automatically grip and center the work. Finger-tip control enables the operator to use the unit for making up, as well as threading, cutting, and reaming.

It has a pipe or conduit range of ⅜ to 2 in.; a bolt range of ⅜ to 1¼ in. Motor is 115-v ac or dc on any cycle. A telescopic oil shaft eliminates outside hose lines.

Other features include quick-opening die head; cutter—which is removable for short nipples—mounted on front jaw housing; and the flat-blade reamer which automatically reams while threading progresses. For bolt threading, the reamer can be removed. All-bronze spindle bearings are pressure lubricated.

The unit comes complete with Alemite grease gun, pull-out chip pan, and six die heads. The unit weighs only 160 lb and is Alemite lubricated.

Quijada Tool Div, Gaines-Collins Co, 5474 Alhambra Ave, Los Angeles 32, Calif.

Copyflex model 14 is a desk-side machine which copies any size office form in seconds. 20-in. width enables large statistical sheets to be reproduced, or ordinary letter-size forms two at a time. Unit, which requires no masters, inks, tray developing, special lighting, exhaust ducts, or installation, takes up less than a sq yd of floor space. It works on a standard 115-v, 60-cycle, ac power circuit.

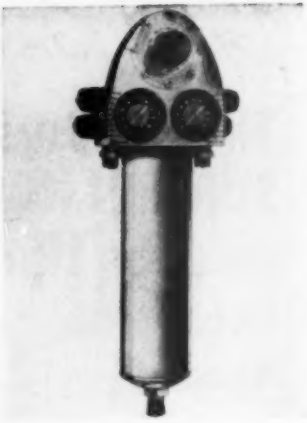
Charles Bruning Co, Inc, Teterboro, N. J.

Single and double anchor-bolt assemblies can be easily installed. After insertion of the anchor bolt, lead sleeve, and cup-shaped steel anchor, a tamping tool mushrooms the lead first. Repeated blows flatten out the steel anchor driving its ribbed steel edges into the walls of the hole. Steel reinforces the lead and provides a firm, solid anchorage that prevents bolts from loosening. The assemblies can be obtained in bolt sizes from 3/16 to ½ in. and up to 5 in. long.

Super-Grip Anchor Bolt Co, 3333 N 22nd St, Philadelphia 40, Pa.

Pilot-bearing bushing is claimed to provide a complete lifetime seal against dust and grit. The cartridge design of the bearing holder means greater accuracy than bearings placed directly in machines or die fixtures since it protects against both thrust and radial loads and offers greater bar support due to greater bushing length. By using the bushings it is claimed that tapered bearings can be adjusted to compensate for wear and are adaptable to receive removeable slip bushings as well as keys or keyways.

J G Jergens Co, 11106 Avon Ave, Cleveland 5, Ohio.



DeVilbiss Air Transformer Has Two-Stage Regulator

This transformer has a built-in two-stage regulator which provides easier adjustment of pressure, requiring only finger-tip control of the adjusting knob. The knob actuates a small pilot regulator which, in turn, operates the diaphragm of the large regulator. There is also closer control of pressure and less pressure loss.

Oil and moisture, present in the compressed air is trapped by a mechanical disk filter. In tests, 97% of entrained water was removed from 100 cfm of air at 100 psi. Gaskets at the top and bottom of the condenser chamber prevent leakage.

The transformer has two regulated air outlets and two unregulated. Capacity is 100 cfm. Entrapped liquids are drained by a push-pull knob. The diaphragm is made of soft-rubber composition with a single fabric insert.

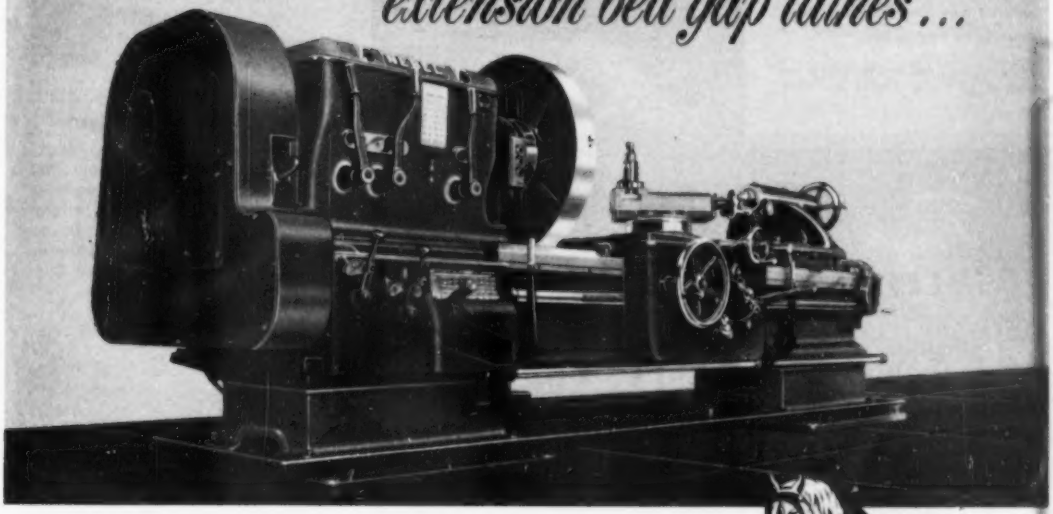
DeVilbiss Co, Toledo, Ohio.

Magnetic driving devices (adapter and hexagon-square shank) have been developed for use only with Williams impact Supersockets to drive hex-head hardened and self-tapping screws. A telescopic magnetic device passes within an assembled socket and contacts the screw head, retaining the head within the socket opening. The magnet is embedded in the drive member and is spring loaded to overcome air gaps. The shank and adapter are available for ¼-in. drive tools with socket openings of ¼, 9/32, 5/16, and ⅜ in.

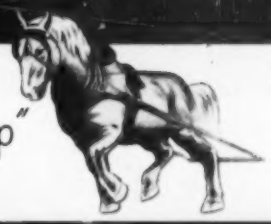
J H Williams & Co, 400 Vulcan St, Buffalo 7, N Y.

Nebel

engine, removable block gap extension bed gap lathes...



"the **Workhorse** of the jet engine shop"



FIVE OF THE COUNTRY'S LEADING jet engine producers are using Nebel lathes proudly and profitably. One Detroit jet manufacturer remarked, "we are very pleased with the lathes and are amazed that you can sell at the price you do!"

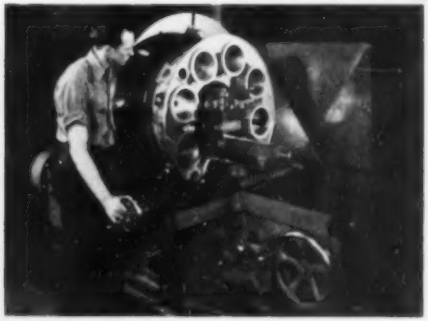
AND THAT'S REPRESENTATIVE OF the warm reception given Nebel lathes everywhere. They're basic, dependable, heavy duty lathes, built to do *big* work at *little* cost. A Nebel's a natural . . . truly the workhorse of the shop.

BUILT IN THREE MODELS: engine, removable block gap and extension bed gap . . . in swing sizes from 18" to 50". There's a size and type for your requirements, too.

Why not send for complete information today?

★ **THE NEBEL MACHINE TOOL CO., CINCINNATI 25, OHIO, U. S. A.**

Builders of fine lathes at modest cost since 1899.



28"/50" NEBEL 'G' SERIES *extension bed gap lathe machining compressor rear frame for a jet engine.*

... in the Aircraft Industry

Pratt & Whitney Air-O-Limit Comparators are a logical choice for the fast, accurate gaging of a wide variety of precision parts. The internal diameters of these master-rod bearings are plated with a soft, sensitive metal and must be gaged in six places to insure absolute uniformity. Previous methods required nearly 15 minutes per piece. Air-O-Limit gaging broke this bottleneck by giving instant, accurate readings without touching the soft metal coating at any point.

Write on your Company letterhead for your copy of Air-O-Limit Circular No. 524-1.

Preferred

PRATT & WHITNEY

AIR-O-LIMIT *Comparators*

Acetylene Gas Torch Lights at Squeeze of Trigger

The pistol-shaped "Torch-O-Matic" lights automatically and shuts off upon release, eliminating separate operation and equipment for relighting, manual valve adjustment, pumping or priming, and warm-up.

Squeezing the spring-loaded trigger simultaneously opens the torch gas valve and sparks the flint. Trigger also can be locked open for continuous flame.

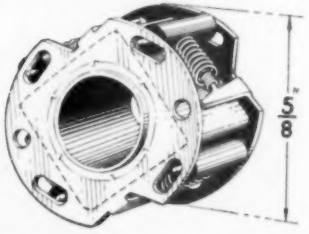
The torch provides heat up to 280 F. Combustion tubes are available in three sizes, ⅛, 3/16 and ¼ in. Accessories include pressure regulator, with either MC or B tank coupling; tank and operating pressure gages; hose and hose clamps; lighting flints; combustion tubes and nozzles, and extension tips.

Velocity Power Tool Co, 7505 Thomas Boulevard, Pittsburgh 8, Pa.

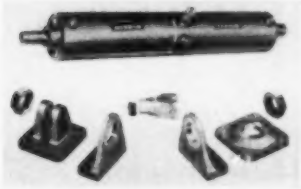
... in the Refrigeration Industry

Pratt & Whitney Air-O-Limit Comparators — combining speed and ease of gaging with dependable accuracy — are widely used throughout the Refrigeration Industry to help meet modern demands for units of low price and high performance. In this typical example, a refrigerator bearing plate is critically inspected with a Two Station, 5 Nozzle Air-O-Limit Comparator. A single, fast operation checks the crankshaft hole for diameter, roundness, bellmouth, taper and straightness.

Write on your Company letterhead for your copy of Air-O-Limit Circular No. 524-1.



SMALL ONE-WAY ROLLER CLUTCH is available for recording instruments, servo mechanisms, and control devices. Known as the Miniclutch, it has an infinitely adjustable ratchet feed. Other features include automatic coupling mechanisms, selective coupling, free wheeling of high-inertia driven parts, dual or multiple drives, and backstop or one-way brake. — *High Precision, Inc, 375 Morse St, Hamden, Conn*

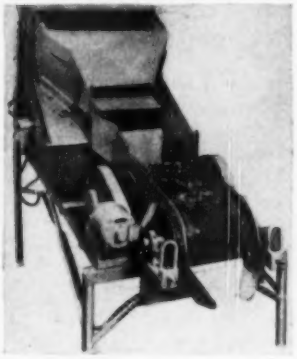


Air Hydraulic Cylinder with Interchangeable Mounting Brackets

Air hydraulic cylinder features interchangeable mounting brackets. Standard shop air-line pressure actuates the cylinder with the built-in hydraulic system regulating forward or reverse stroke movement by adjustment of speed control.

The flush exterior permits installation in restricted space. If used for machining, the cylinder permits rapid traverse (if skip feed by-pass is used), finely controlled movement of work, and fast reverse action.

Modernair Corp, San Leandro, Calif.

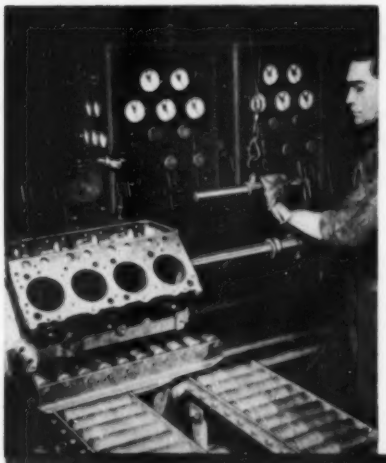


Finishing-Chip Separator Can Be Either Mechanical or Magnetic

The MMG 34-12 is designed to separate both ferrous and non-ferrous parts from Roto-Finish abrasive chips. The unit can be used either as a magnetic or mechanical separator, since the two different mechanisms are interchangeable on the portable frame.

A hoist pan containing the mixed parts is placed on the incline loading support. When used for mechanical separations, the mixed mass passes over a motor-driven, agitated separator screen. Oversized parts are discharged from the top of the screen, while processing chips go through the screen and discharge into a pan below. Amount of agitation is controlled by a variable-stroke adjustment. Screens are available

... in the Automotive Industry



This Multi-Station Air-O-Limit Gage is typical of the many special comparators and gages developed by Pratt & Whitney for the Automotive Industry. In this application, the gaging plugs, conveniently supported from above by a Thor counterbalance, are brought to the work; 5 different critical elements of the crankshaft and the camshaft bearing bores are simultaneously checked in a single gaging operation.

Write on your Company letterhead for your copy of Air-O-Limit Circular No. 324-1.

AIR-O-LIMIT Comparators

PRATT & WHITNEY
DIVISION NILES-BEMENT-POND COMPANY
WEST HARTFORD 1, CONNECTICUT, U. S. A.

First Choice for Accuracy

CUTTING TOOLS • GAGES • MACHINE TOOLS

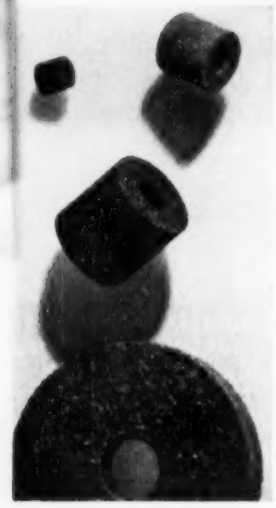
*OFFICE ONLY

... in the Bearing Industry

By the extensive use of Pratt & Whitney Air-O-Limit Comparators, the Bearing Industry is able to hold close tolerances and make accurate, dependable 100% inspections rapidly and economically. The Adjustable, Two Station Air-O-Limit Gage shown here speeds final inspections of assembled bearings by simultaneously checking both inside and outside diameters.

Write on your Company letterhead for your copy of Air-O-Limit Circular No. 324-1.

IT'S HERE! the inside story on internal accuracy...



SIMONDS ABRASIVE CO.

Grinding Wheels

Here's the *right* start for an *exact* finish . . . Simonds bulletin on internal grinding wheels. It tells you *why* they're right . . . *why* they grind fast and cool . . . *why* they give the same high precision each time you order them.

You can have this bulletin free, together with the name of your Simonds distributor. He can supply you with Simonds Abrasive Company grinding wheels for every job . . . snagging, finishing, sharpening, cutting-off and polishing.

Write requesting bulletin ESA-29.

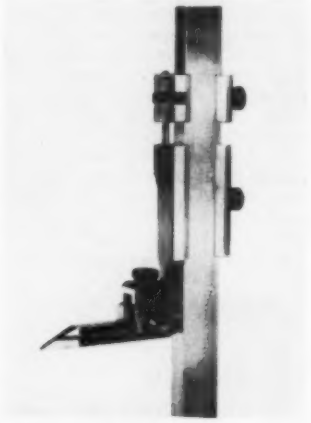
SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON
DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co. Ltd., Arvida, Que.

in mesh sizes 1/16 to 1½ in., and correspond to Roto-Finish chip sizes. Screen size is 34 x 27 in.

When using the magnetic separator unit, the parts and chips pass over a magnetic pulley. Parts are separated magnetically and then conveyed to a container, while the chips fall into a pan below. Separator is driven by a 1/3-hp, 220/440, 3-phase motor.

Roto-Finish Co, 3700 Milham Rd, Kalamazoo, Mich (P O Box 988)



Homestrand Height Gages

A universal clamp on this height gage eliminates the need of an extra attachment when using dial gages. The clamp can be used with Vipp dial indicator, the "Last Word" universal-shank dial indicator, and the Brown & Sharpe No. 725 dial attachment, and others. An extra screw on the side of the clamp simplifies shank-width adjustments.

The gage marker has been modified so that it can be used with a depth-measuring-rod attachment without the use of an extra clamp. The depth gage is included. Also, the height-gage attachment arms are identical in size for both 18- and 24-in. models. The gages are available in 12-, 18-, and 24-in. sizes.

Homestrand Inc, Larchmont, N Y

Standard Cutting-Tool Line

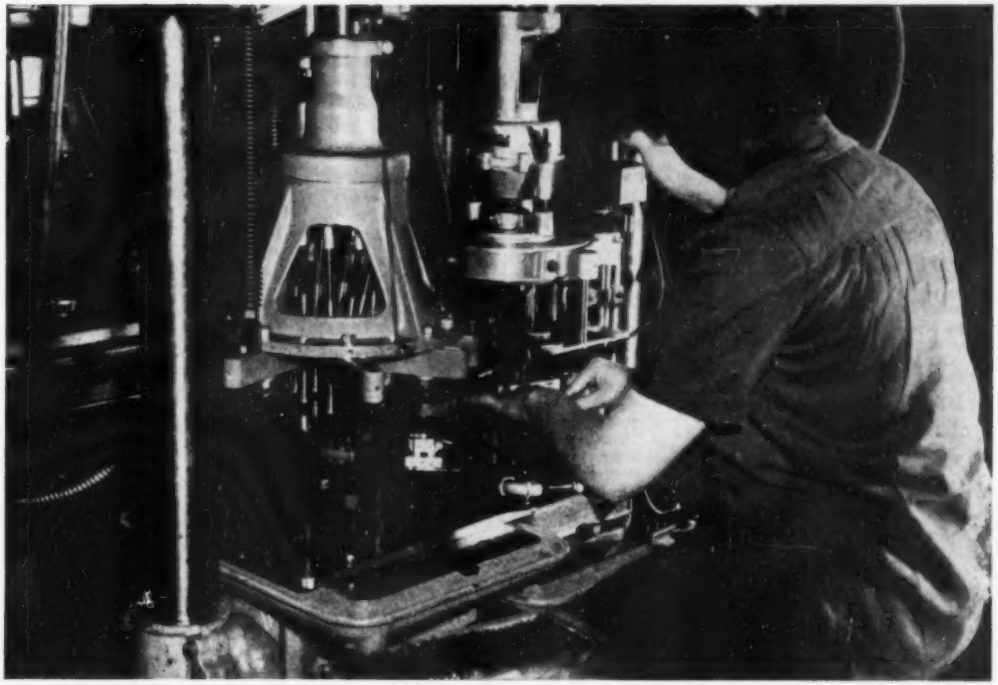
New line of cutting tools will include a complete selection of standard end mills, saws, milling cutters, key-slot cutters, hobs, and shaper cutters.

Known as Illinite, it also will include gear-measuring blocks, tool bits, and die files.

Illinois Tool Works, 2501 N Keeler Ave, Chicago 39, Ill

BUILDS $10,000 SPECIAL MACHINE IN FOUR WEEKS AT COST OF $2500.

Lewyt Corporation Eliminates 16-month delay by use of Bellows "Controlled-Air-Power" Devices



Lewyt Corporation, contract manufacturers and famous makers of the Lewyt Vacuum Cleaner, faced a 16-month delivery delay and a $10,000 price on a machine to make variable condenser spacer rods for the Signal Corps. Neither Lewyt nor the Signal Corps could wait that long.

Tool room ingenuity, coupled with Bellows "Controlled-Air-Power" Devices, enabled Lewyt to build their own machine, which would automatically drill 8 holes and tap 4 of them in the spacer rods. They built this machine in 4 weeks and at a cost of only $2,500.

Utilizing a Bellows Rotary Feed Table, a Bellows Drill Press Feed, two ordinary drill presses, an 8-spindle adjustable drilling head, and a 4-spindle adjustable tapping head, this machine produces 360 spacer rods per hour, performing 4,320 separate operations within this time.

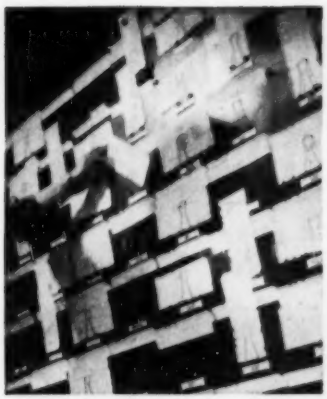
This story is typical of the experiences of thousands of manufacturers, large and small, in all lines of industry. No matter what you make, chances are Bellows "Controlled-Air-Power" Devices can help you make it quicker — and at less cost.

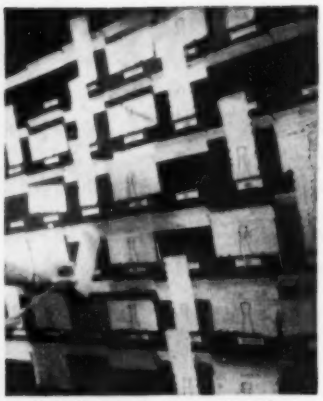
If you'd like a copy of the Foto Facts File describing this operation, write The Bellows Co., Dept. AM-1152, Akron 9, Ohio. Ask for Foto Facts File FF 52-455.

The Bellows Co.

AKRON 9, OHIO 631A

"CONTROLLED-AIR-POWER" FOR FASTER, SAFER, BETTER PRODUCTION





One movement of Job Time Ticket on these McCaskey Boards directs dispatcher, move-men, set-up men and operators according to production plan . . . with

NO ASSEMBLY DELAYS FROM MISSING PARTS NO EXCESS WORK IN PROCESS

Barcalo Manufacturing Company, Buffalo, N.Y. has met the problems of dispatching production of a widely diversified line of products . . . from hand tools and metal furniture to pillows and mattresses . . . with McCaskey Machine Loading, Scheduling and Job Assignment.

Shop orders formerly were handled in a "blind file" and one or more parts often were overlooked or delayed with serious results. This is totally eliminated by the use of McCaskey Machine Control Boards and the following procedure developed by W. J. Navelle, Production Control Manager:

1. Job time tickets are pre-written without operators' clock numbers (see paragraph 7) and assigned to machines by Production Control Department.
2. They are placed by dispatcher in rear pockets of McCaskey Machine Control units in sequence specified by Production Control. Load is recorded on load cards.
3. Foreman selects jobs to be run next and moves tickets to front pockets of control units.
4. Dispatcher issues stores requisition for material, attaches to and notes action on job ticket.
5. Material move-man takes requisition to stores, delivers material to or near machine and marks ticket when move is complete.
6. Set-up man checks board, draws tools and dies and marks ticket when job is ready to run.
7. Job is assigned to operator by dispatcher; his number is written and starting time is stamped on ticket. Ticket then is visibly filed under clip spring at front of control unit.
8. When job is finished, dispatcher rings out ticket, enters production summary on permanent record and sends ticket to Production Control.
9. Production Control completes its record and sends ticket to Payroll Department.

Foreman, by quickly referring to McCaskey Board, selecting jobs to be run and moving job tickets thus provides instructions for (1) dispatcher, (2) move-men, (3) set-up men and (4) operators. Jobs are run and essential operations performed according to Production Control's Plan. This McCaskey installation once again demonstrates how readily duplicated effort, delays and confusion are replaced by economical, planned production.

Let us talk with you about a McCaskey procedure for your department or plant. Equally adaptable to line or job shop production, assembly, maintenance or individual job assignment. Mail coupon today for complete information.

McCASKEY REGISTER CO.
ALLIANCE, OHIO

Please send me bulletins describing McCaskey Machine Loading, Scheduling, Dispatching and Job Assignment.

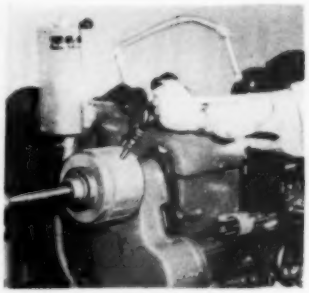
Name _____

Position _____

Company _____

Address _____ AM-11-24-52

McCaskey
INDUSTRIAL CONTROLS
PRODUCTION • INVENTORY
TOOLS • COSTS • PAYROLL
THE McCASKEY REGISTER CO.
ALLIANCE, OHIO
McCaskey Systems, Ltd., Galt, Canada
The McCaskey Register Co., Watford, England

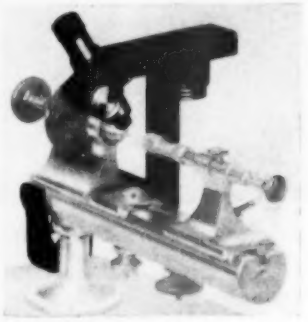


Pneumatic Collet-Closer Reduces Operator Fatigue

A flick of the valve on the Wil-Numat automatic collet closer and the work is in position, there is no vibration or jarring of stock. The feeding and releasing of bar stock through the spindle can be done without stopping the machine. Standard equipment can be used.

The unit is adaptable to both production and toolroom operation of turret lathes, automatic screw machines, and other machines of ½- or 1-in. capacity. It can be installed in a few minutes without any alteration in the machine. The complete unit includes collet closer, air regulator, and valve with necessary air-pressure lines.

Williams Metal Products, 3715 South Robertson Blvd. Culver City, Calif.



Wide-Field Microscope For Jeweler's Lathes

This wide-field microscope can be attached to any make of jeweler's lathe for inspection and operation. It provides fixed magnification of either 20 or 40X, with or without a reticle. It swings out without losing focusing adjustment.

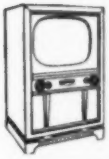
Fine focusing by means of a rack and pinion is a feature, and the heavily cast aluminum body deadens vibration.

Pacific Transducer Corp, 11921 West Pico Blvd. Los Angeles 64, Calif.

Philco Famous for Quality the World Over

Cuts costs with Yale Electric Trucks

Famous for Quality in Materials Handling Equipment



What business are *you* in? Food-processing, motor freight-terminal operation, textiles, lumber, tool-making? Whatever it is—you *must* move materials from one point to another.

How many men do you employ? Ten—or ten thousand? Regardless of the number, efficient, economical handling of your materials is more important today than ever before.

It may mean the actual difference between profit and loss!

YALE MATERIALS HANDLING EQUIPMENT... is accounting for 50 to 75% savings in many businesses today—businesses that never realize how costly their old-fashioned handling methods were. Yale is the world's leading manufacturer of materials handling equipment. You can depend on Yale—to give expert attention to your specific handling needs.

YALE

MATERIALS HANDLING EQUIPMENT

Yale Electric Hydraulic fork trucks gave Philco—world-leader in electronic equipment—this 3-way saving...

- **MONEY SAVED!** Knocked the bottom out of handling costs in plant, warehouse and at shipping points.
- **LABOR SAVED!** The change-over from manual handling methods to mechanized Yale equipment greatly increased manpower's effectiveness—released extra men for more important productive work.
- **TIME SAVED!** Boosted parts handling, cut assembly time, spurred shipping operations, and eliminated many bottle-necks at times when increased production was absolutely essential!

MAIL THIS COUPON TODAY

The YALE & TOWNE Manufacturing Co., Dept. 1811
Roosevelt Blvd. & Haldeman Ave., Philadelphia 15, Pa.

I want to know how Yale Materials Handling Equipment can help me.

☐ Please have your local Representative call.

☐ Please send free copy of THE PICTURE STORY OF YALE MATERIALS HANDLING EQUIPMENT.

Company_____

Name_____ Title_____

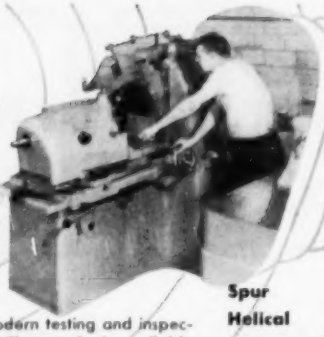
Street_____ City_____ State_____

In Canada write: The Yale & Towne Manufacturing Company
Box 337—Postal Station "A"—Toronto

YALE is a registered trade mark of The Yale & Towne Manufacturing Co.

YALE GAS AND ELECTRIC INDUSTRIAL TRUCKS • YALE WORKSAVERS • YALE HAND TRUCKS • YALE HAND AND ELECTRIC HOISTS • YALE PUL-LIFTS

ears for gears



Because minimum noise level is so important in some applications, we will—whenever required—individually sound check gears for maximum silence in operation. Modern testing and inspection equipment—such as that illustrated—is available to electronically check gears for exacting noise limits, under a specified load and RPM. Through such thorough inspection quiet operation is assured.

The next time you have a special gear need, let quiet gears help reduce unnecessary noise—specify The Cincinnati Gear Company. Write, wire or call for full information.

Spur
Helical
Worm
Herringbone
Internal
*Coniflex Bevel
Spiral Bevel
Spline Shaft

*Reg. U. S. Pat. Off.

THE CINCINNATI GEAR COMPANY
"Gears . . . Good Gears Only"
Wooster Pike and Mariemont Ave. • Cincinnati 27, Ohio

C & J
Geared-Head
LATHES 16 INCH 12 SPEED

ONLY ONE MODEL • ONLY ONE SIZE

FOR HIGH GRADE PRACTICAL GENERAL SERVICE

- Tooled and equipped for efficient production
- Exceptionally long carriage bearing—23½ in.
- Feed provided by separate rod—lead screw is used only for thread chasing

Complete regular equipment includes thread indicator.

Guaranteed accurate to good commercial standards. Write TODAY for new bulletin 38-A-8.

CARROLL & JAMIESON MACHINE TOOL CO.
BATAVIA, OHIO

ROUND TABLE *Discussion*

BORROW — OR STEAL?

Should workers be allowed to borrow tools for occasional private use? Will such a policy lead to excess? Will the tool be borrowed anyway, if the request is refused? Readers say . . .

THE USE OF company property by individuals on their own projects has always faced us. Some companies do set up very definite policies and these must be strictly adhered to by all concerned. Whether such policy reduces tool loss or increases it can be debated by those companies who have operated such plans.

Many times it is the individual who administers the plan or policy which determines the outcome or result. Not always is it possible to write into the policy how it is to be administered under each and every condition, so we are again faced with individualism.

Usually the most successful policy is to have unwritten rules and regulations, but a very clear understanding by each supervisor as to these rules. Naturally a control of some kind must be used. This, in many companies, is the pass which must be obtained in order to remove anything from company premises. This pass slip is so made out that it is an agreement between the individual and the company whereby the individual is responsible for any damage or loss of the tool which he is borrowing. The tool is checked by the foreman upon its return and the pass slip is cleared. These slips go to the accounting and payroll department. The borrower, if he damages or loses the tool, has the cost taken from his pay. Naturally this keeps loss and borrowing at a minimum. Yet the company is willing to lend its tools, which serves to create a good employer-employee feeling.

The strange fact is that the feeling under this plan is unlike that under a closed shop arrangement where no tools can be borrowed. For under such an arrangement, the supervisors are usually exempt and the worker does resent the fact of being discriminated against.

The stealing of company property is something else again. Usually the tools which are taken in this man-

fier are not those which are readily usable to the "borrower."

If a company has no policy at all, then a foreman has to determine in his own mind whether the individual borrowing the tools is reliable. This burden should not be thrown upon the foreman. It would be much better for the foreman to refer such requests to some higher authority within the company. This is just another point where many companies do not properly establish policies which can be lived with and which can aid the foreman. The instruction of foremen and the establishment of clear-cut company pol icies are the key to good, harmonious relations on all subjects with the workers.

Charles D Townsend
West Hartford, Conn

•

PIGS IS PIGS

How much responsibility has a machinist for keeping his work area in reasonably clean condition? Is this completely the sweeper's job, or will an able worker naturally tend to keep his territory orderly?

ORDELINESS is like measles or smallpox—it's catching. If a new man starts in at a shop he usually is governed by the neatness of the other men around him.

Small dumps, usually found around the oil fields, general repair shops tucked away in the narrow streets of the great cities, have an atmosphere about them that resembles a flaxseed poultice—sloppy as hell. It is in such shops that you'll usually find the men who, through no fault of their own, fall in with the order of the day and become super-swinging berkshires who drive home at night without even cleaning up their faces and hands.

I'm not talking through my frayed Panama either. Ordinarily I am a

"He wasn't kidding when he said he'd like to lay his hands on a good secretary."

Are you throwing THOUSANDS OF DOLLARS into the SCRAP BIN?

You can now chrome plate worn gages *IN YOUR OWN SHOP*

This compact new chrome plating unit is saving real money for leading engineering and manufacturing concerns throughout the country. For instance, here's what Taller and Cooper, Inc., foremost makers of toll collection equipment and builders of electro-mechanical measuring and recording devices, say about their Chromaster installation:

"Within one hour from the time a space was arranged for the unit, the Chromaster was in operation. In the very first day over $100.00 worth of undersize plug gages that normally would have been discarded were replated and put back in use in our inspection department."

Same saving applies to other small tools

Normal life of your cutting tools and wear parts can be multiplied 3 to 10 times by this accurate, simplified method of chrome plating right in your own shop. Chromaster deposits chrome with positive uniformity yet the average job takes only 3½ minutes.

A Chromaster for every shop

Model A-20 (shown here) is a 20-amp, bench-mounted unit for the gage room or tool crib; plates up to 10 sq. in.

Model A-30, 50-amp, bench-mounted unit for larger shops in plating of cutting tools. Plates up to 25 sq. in.

Model A-250, 250-amp, floor-mounted unit for production plating of small parts in greater quantities or larger parts with areas up to 125 sq. in.

Chromaster

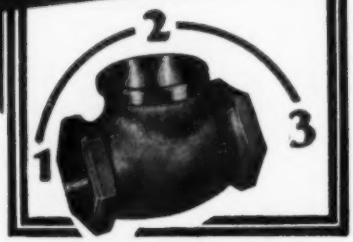
Write for cost-cutting free information today!

Industrial Chrome Division
Ward Leonard Electric Co.
17 South Street,
Mount Vernon, N. Y.

Please send me complete information on Chromaster industrial chrome plating

NAME .....
COMPANY .....
ADDRESS .....
CITY ..... ZONE ..... STATE .....

ALL ENDS OF PARTS
Completely Finished
"1·2·3"
ON THE
GOSS *and* DeLEEUW
Automatic Chucking Machine
in 1 SET-UP

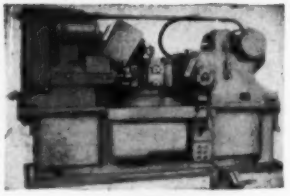


This recent Goss & DeLeeuw development has already received universal acclaim as an outstanding development.

In speed, ease of tooling and precision finishing, the "1-2-3" chucker provides engineering advantages which result in vastly greater production at a fraction of parts' costs by other methods.

Easy, fast change-over from job to job makes this machine ideal for short-run requirements. Sturdy construction, power and speed make its advantages apparent on long runs.

"1-2-3" means ability to handle work requiring machining operations on one, two or three ends simultaneously or in sequence — a method exclusive with Goss & DeLeeuw and offered on this machine.



Illustrated literature available promptly on request. Send samples of your work for time and cost estimates.

GOSS & DeLEEUW

GOSS *and* DeLEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

neat individual, but when I was a youngster struggling to suppport a wife and a couple of kids, it was not up to me to dictate to the boss about keeping his shop in order. Conditions were so bad in one of those dumps that one would almost have to wear snow shoes in order to find his way around the large planer that continually ploughed its cast-iron chips on the floor. Either the planer is entirely buried by this time or the old building has long since collapsed.

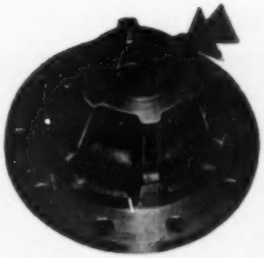
Back in the days of no cleanups, the foreman looked fitting for the head of such a joint. His vest was simonized down the front and his chin dripped from an oversupply of masticated Mail Pouch. He'd sit at his desk, reclining in his swivel chair, and fumble around among a thousand and one papers trying to find an order of the moment. When evening came I was so damned tired from struggling through trash that I would have drooped with unnecessary added years had I remained. About the only ambition I ever saw the boss display was a yawn and a stretch.

Later I was fortunate enough to get in a shop where order was the big thing of the day. The foreman was immaculate in his dress and gave evidence of being alive. Not only did he insist upon the men giving the shop the once-over every weekend, but he called one's attention to the necessity of keeping order around the bench anytime during the day. When one washed up at five he was as active as at eight in the morning simply because his morale was kept up to its highest at all times.

For a man to take the stand, as did Al's particular man from Kansas

"Now a word of caution, lest you forget the instructions and blow your tool head off!"

AS A SHAFT . . . Rollpin serves as an axle for the sparkwheel of a cigarette lighter. No riveting or threading necessary . . . faster assembly. Note flush, clean fit.



AS A DOWEL . . . Rollpin is used here to prevent rotation of a thrust bearing. No reaming, no special locking. Easily removed. Lowest possible dowel pin cost.

AS A CLEVIS PIN . . . here Rollpin holds firmly in clevis, permits free action of moving member. Rollpin application above is with the plate of a home workshop tool.

AS A KEY . . . Rollpin demonstrates its ability to do away with precision tolerances, in this heating system damper arm. Faster, cheaper and more satisfactory than usual assemblies.

AS A STOP PIN . . . in this application, Rollpin is shown in a ratchet wrench adaptor. With its light weight and high shear strength, Rollpin functions perfectly . . . cuts assembly costs.

AS A SIMPLE FASTENER . . . Rollpin replaces a set screw in pinning a gear to a shaft. Assembly time is shorter, service life longer. Vibration-proof flush fit. Easily removable.

YOUR IMPORTANT FASTENING JOBS

are cheaper . . . faster, with ROLLPIN

TRADE MARK

Rollpin is a pressed-fit pin with chamfered ends. It drives easily into holes drilled to normal tolerances, compressing as driven. No reaming, no tapering, no extra assembly steps required. Rollpin fits flush, *locked* in place by the constant pressure it exerts against the hole walls. Can be inserted with automatic press, or by hand—removable with a drift or pin punch.

Rollpin is reusable again and again.

Elastic Stop Nuts with the famous red collar are another ESNA product

ESNA

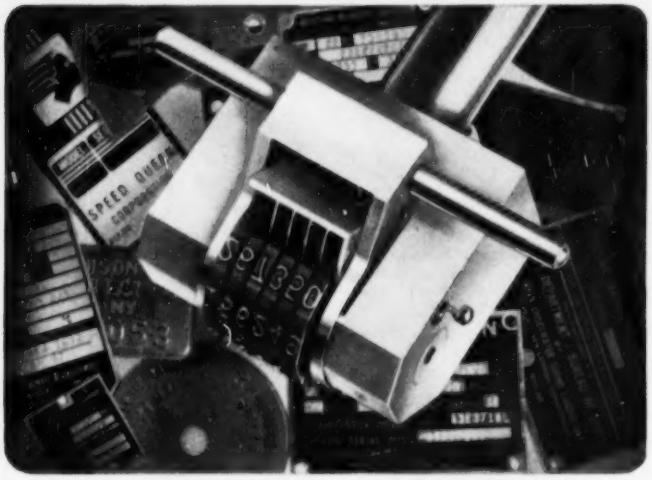
MAIL COUPON TODAY. If your present operations or plans include the above applications—or set screws, rivets, hinge pins, cotter pins, pivot pins, taper pins—you can't afford to be without complete details on Rollpin. Write now—find out how much faster and cheaper Rollpin can do the job.

Section R1-119, Elastic Stop Nut Corporation of America
2330 Vauxhall Road, Union, N. J.
Please send me the following free information on ESNA self-locking fasteners:

☐ Rollpin bulletin and sample Rollpins ☐ AN-ESNA conversion chart
☐ Elastic Stop Nut Bulletin ☐ Here is a drawing of our product. What fastener do you recommend?

Name _____ Title _____
Firm _____
Street _____
City _____ Zone _____ State _____

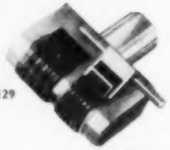
LEADERS IN INDUSTRY MARK WITH NOBLEWEST



Noblewest Numbering Heads

There's Nothing Finer For
PERMANENT NUMBERING

Whatever your numbering problem, a NOBLEWEST Numbering Head will do the job better. Automatic heads for serial numbering and non-automatic heads for selective numbering are available. Specially designed heads offer unlimited possibilities for *constant, selective* and *consecutive* numbering. For complete information write to Noble & Westbrook Manufacturing Co., 17 Westbrook Street, East Hartford 8, Conn.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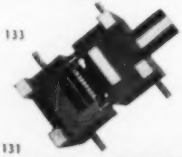
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131

MODEL 129: Special head combines set of automatic wheels and set of non-automatic wheels. Head stamps a serial number group and a random number group.

MODEL 151: NOBLEWEST Rocker Style Numbering Head. Designed for roll marking on flat surfaces. Dovetail shank fits NOBLEWEST marking machines. Both automatic and non-automatic models available.

MODEL 133: NOBLEWEST Embossing Head. Male and female wheels form raised characters in metal. Debossing heads for depressed characters. Both automatic and non-automatic styles.

MODEL 131: Includes wheels for automatic *consecutive* numbering mounted in special frame with permanent one-piece marking die for *constant* marking. Die is mortised for interchangeable steel type for *selective* numbering.

MARK IT BEST WITH NOBLEWEST

EQUIPMENT FOR MARKING · GRADUATING · EMBOSSING · NUMBERING

City, that he wasn't expected to do anything but machinist work seems to indicate that he has spent his time in shops where the workers didn't mind falling over accumulated mess. We can ascribe his refusal to cooperate to pure bullheadedness on his part, or the man had become so ingrained with disorderliness that he has to be converted to the theory of cleanliness in pretty quick order. If Al wants his shop to revert to disorderliness just let him allow the man to have his way. I'd put a fuse in his jet motor and light it and send him on his way.

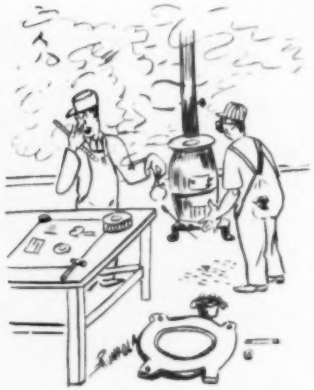
I don't know why it is that some workers seem to leave a trail behind them as they work; somehow or other they have been neglected in their early training. Some workers are like some autoists; they don't hesitate to enjoy the weekend drives on our highways, but they don't hesitate either in cluttering them up with empty beer cans or bottles and scraps of garbage from their lunchbags.

Frank Van Horn
Auburn, Calif

•

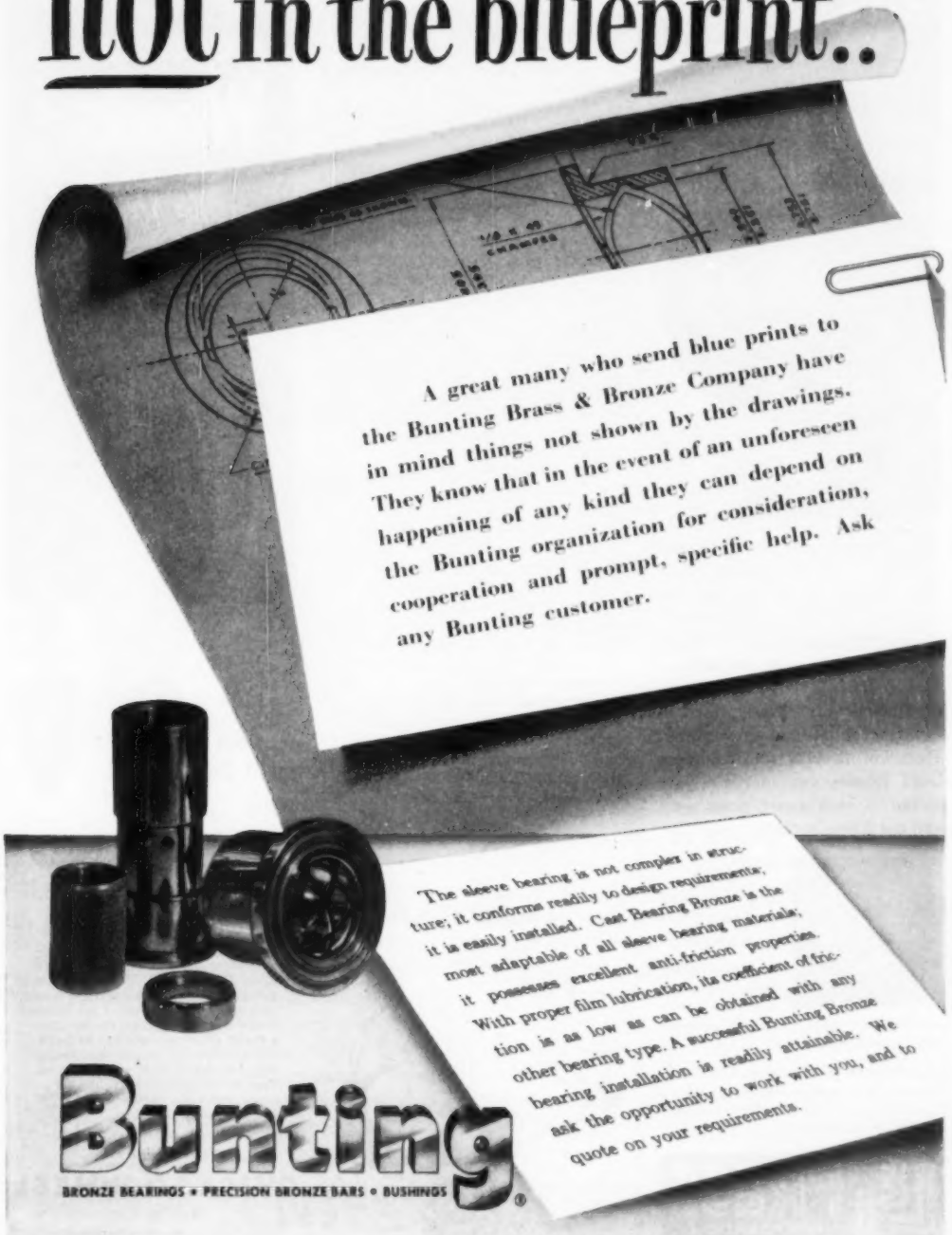
MY FIRST CONTACT with a genuinely orderly shop struck me as a delightful surprise and you can depend upon it that I did not react to it as did our fastidious friend, Rogers.

Prior to that it was my unfortunate lot to be employed in shops where there was no time allotted to putting the house in order at the end of the week. Not being cognizant with the cleanup period, I kept right on working until one of the fellows called over to me, in a stentorian voice that could be heard three floors down in the main office:



"Remember the day some one put the limburger on the hot stove and pretty near gagged every one in the place?"

not in the blueprint..



A great many who send blue prints to the Bunting Brass & Bronze Company have in mind things not shown by the drawings. They know that in the event of an unforeseen happening of any kind they can depend on the Bunting organization for consideration, cooperation and prompt, specific help. Ask any Bunting customer.

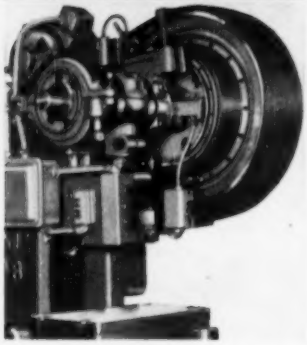
The sleeve bearing is not complex in structure; it conforms readily to design requirements, it is easily installed. Cast Bearing Bronze is the most adaptable of all sleeve bearing materials, it possesses excellent anti-friction properties. With proper film lubrication, its coefficient of friction is as low as can be obtained with any other bearing type. A successful Bunting Bronze bearing installation is readily attainable. We ask the opportunity to work with you, and to quote on your requirements.

Bunting®

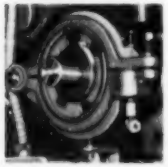
BRONZE BEARINGS • PRECISION BRONZE BARS • BUSHINGS

THE BUNTING BRASS & BRONZE COMPANY • TOLEDO 1, OHIO • BRANCHES IN PRINCIPAL CITIES

MORE Speed – Safety Production with L & J - FAWICK AIR CLUTCHES



Here's the answer to more production — L & J Presses equipped with L&J-Fawick Air Clutches and variable speed drives. This unbeatable combination gives you maximum speed for each operation — often 2-1/2 to 3 times normal production, greater safety through rapid, shock-free, full-power operation. Let us show you how these L & J Presses can increase your output of high-speed press work and cut down operating cost.



NEW

AIR RELEASE SPRING-SET BRAKE

Another important L&J safety feature. Brake automatically applied if air pressure fails — positive, foolproof.

L&J Presses are made in 12 O. B. I. models—back geared and plain flywheel types—8 sizes from 6 to 80 ton capacities. *Write for literature.*

L&J PRESS CORPORATION

1629 STERLING AVENUE
ELKHART, INDIANA

"Hey, pretty boy, what do you think you are, a gardenia? Get busy with the brush."

It didn't take long to fall in with the others and after giving my bench a thorough going over, I picked out a lathe nearby and made it look like a new one. Then, following in the wake of the others, picked up a piece of clean waste and gave my hands the usual toolmaker's shine.

I had had experience prior to this in shops that had a "cleaner-upper" do the tidying, and invariably on Monday mornings I would be at a loss to know where something or another was placed. Whether from a pretty good excuse to kill some time right at the start of the day, or actual loss of something pertaining to their jobs, the whole shop seemed to be going around in circles for the first ten or fifteen minutes. Needless to say, this can certainly be classified as productive leaks.

There is nothing more encouraging for a man than to arrive at his bench and find everything in apple-pie order. It enables him to start out the week right. The amount of productive time lost in cleaning up is nil compared with the satisfaction the men have in starting the week with a happy disposition.

Could be that Rogers was brought up in the progressive school where he has been led to believe that to do as he wishes will relieve him of frustrative tendencies. I've had enough of that tripe in my years in education and the more I came in contact with it, the more I wished I had had certain individuals in the shop so that I could relieve my own frustration by telling them to do

"Darn wife keeps losin' my vacuum bottle."

Chicago MOUNTED Wheels

They're the Best

...now even better with

79E BOND

the new miracle grinding wheel bond

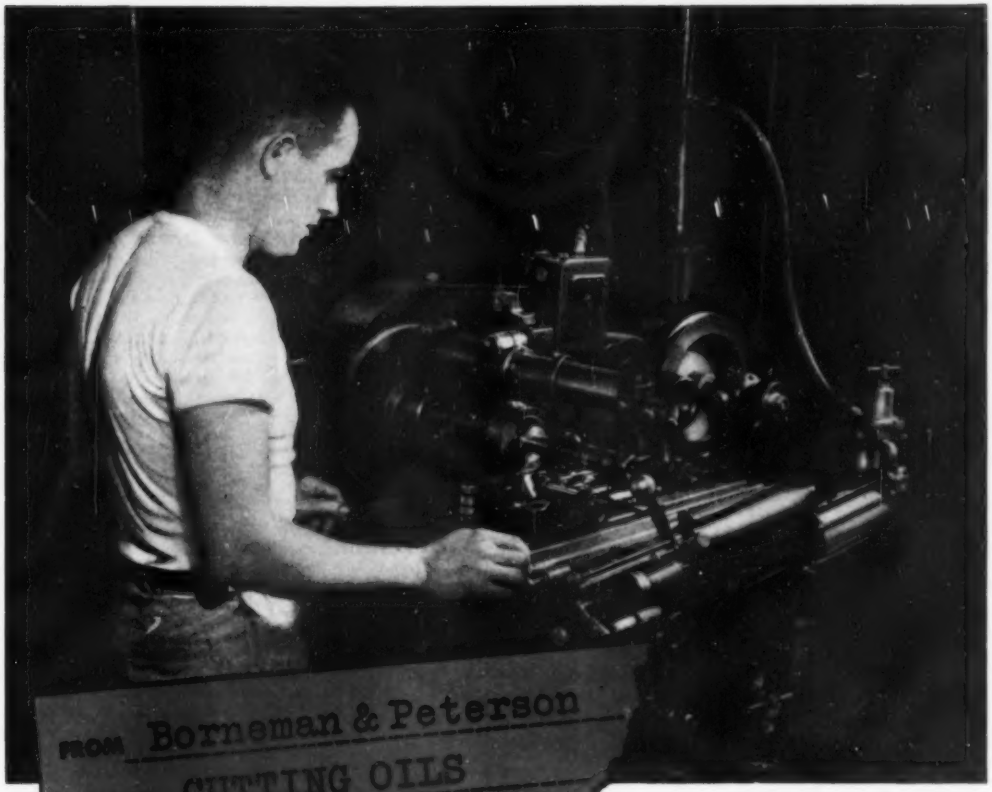
Choose Chicago Mounted Wheels – bonded with 79E Bond – and you'll never buy any other! This tough new grinding wheel bond, exclusive with Chicago Wheel, has taken the industrial world virtually by storm, doing a better grinding, burring and finishing job faster. Greatest selection of sizes and shapes for every application. Best of all, deliveries are good . . . ready when you need them. Try 79E Bond Mounted Wheels.

WRITE today for full information and literature. It's free.

CHICAGO WHEEL & Mfg. Co.

Dept. AM, • 1101 West Monroe Street
Chicago 7, Illinois

OFFICES IN PRINCIPAL INDUSTRIAL CENTERS



ANY tiny production improvement looks big when it can be multiplied by acres of machines. But even without that—in an average size screw machine products shop like Borneman & Peterson's at Flint, Michigan—the improvement effected with Cities Service cutting oil registered impressively.

"We were getting fair results," write Borneman & Peterson, "before ever talking it over with a Cities Service Lubrication Engineer."

But they did talk it over, and then tried out his recommendation on a regular job of cutting ½" x 1" slots in tough tool steel. At once, the use of Cities Service Chillo cutting oil notably improved product quality.

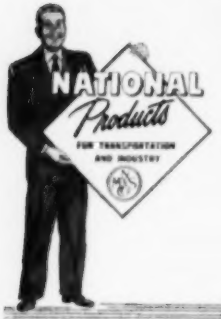
So..."We then tried using Chillo 10 on our threading machines, and found that not only do we get a better thread, but we have increased chaser life approximately 25%."

From there on, still more uses have kept turning up in this shop for Cities Service cutting oil, simply because it distinctly pays off...as it always does when a Cities Service Lubrication Engineer offers pinpointed lubricating recommendations. He draws on the c-o-m-p-l-e-t-e Cities Service industrial line, and on deep, wide experience. You can draw on *him* by writing CITIES SERVICE OIL COMPANY, Dept. K37, Sixty Wall Tower, New York City 5.

CITIES SERVICE
QUALITY PETROLEUM PRODUCTS

Castings by National

selected for Quality and Dependability



Products bearing these familiar trademarks have all established enviable reputations for quality and dependability. And to guard product reputations, these manufacturers *continue* to specify castings by National —one of the Nation's largest founders.

National's unparalleled experience in producing malleable, heat-treated malleable, and steel castings is at your disposal. Sales offices and engineering facilities are located at all five strategically located plants.

A 1868

PLANTS LOCATED IN Sharon, Pa., Cleveland 6, Ohio, Indianapolis 6, Ind., Melrose Park, Ill., and Chicago 50, Ill.

SEE

A 16mm technicolor film. Narrated by Edwin C. Hill, this 27-minute film tells how malleable iron is made . . . tested . . . used . . . how its production economy, ductility, machinability, toughness will give you a better finished product. Available for group showings.

NATIONAL Products FOR TRANSPORTATION AND INDUSTRY

NATIONAL MALLEABLE and STEEL CASTINGS COMPANY
CLEVELAND 6, OHIO Est. 1869

this or else. The man who blew in from Kansas City would either jump in and do his share with the rest of the boys or he could blow back again. It is true that the man was hired out to do machinist work, but being a machinist implies cleaning up after the work is done.

There is a certain amount of disorder caused by a week's intensive work, and it is wise to take time out to have a general back-to-order cleanup so that things won't get in—what the average metal buster would call—a hell of a mess. Could we but feel the miraculous value of a periodic mental cleanup, we would all take time out—early morning preferred—to sit down quietly and get our controlling house in order for a productive day.

J Homewood
Ontario, Calif

•

A FAMOUS HUMORIST once said: "If dirt were trumps, what hands you would hold!" Some men are like that; they don't mind the dirt. Pigs of the human variety are all around us.

When a shopworker doesn't fall in with the customary idea of cleaning up his immediate workplace periodically, he needs a well-earned lecture on good housekeeping by his foreman. Of course he wasn't hired as a janitor. That's beside the point. Good common sense should dictate that the sweepers are responsible for getting rid of chips and general waste around the machines, but the individual's work area should be straightened up by the worker himself so that the cleanup men only have small dirt to pick up.

I think it is a good idea, as prac-

"Now, let's see—a 4½" O.D.—wall thickness 1/16"—two walls or twice a sixteenth equals 1/32"—gives I.D. of 4 15/32" . . . . . "

Now . . . Seams Reduced to **ABSOLUTE MINIMUM** on these NEW AO Gloves!

HAND PROTECTION

AO 514 ASBESTOS GLOVE

Yes, for workers' comfort . . . for savings for our customers, we've redesigned our asbestos glove line to eliminate seams wherever possible. By reducing seams from 8 to 3, there's not only greater working ease for the user but longer work life for the glove.

MAKE THIS COMPARISON TEST!

Look at any conventional asbestos glove. Note the vertical seams that extend to the cuff. Note the seams that secure gauntlet to glove. Now check against the large photograph here. You'll see the seams on the thumb and only ONE SEAM extending the length of the glove (on the back). Note also the absence of horizontal seams—(thus assuring a stronger glove and longer life which means valuable savings).

AO 1514 Glove with leather-reinforced palm.

AO 2514 Glove with asbestos-reinforced palm.

AO 3514 Glove with full leather-reinforced palm and finger area.

QUICK FACTS:

- Finest grade specially treated asbestos, recommended for extreme heat.
- Yarn is closely woven.
- Double stitched for long service.

AO's Industrial Vision Program increases production, decreases accidents. Write today for free booklet "Improved Industrial Vision" to 1113 Vision Park, Southbridge, Massachusetts.

American Optical
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

"Third Hand"

Patent pending

- • • positions your work at any angle . . . attachments screwed into ball (see photos)
- • • locked rigidly in position with wrench
- • • easily converted from use on bench to best holding tool for drill press or milling machine
- • • gives you that "third hand" when you need it
- • • pays for itself in a few hours' operation

The *Third Hand* IS A MONEY-SAVING TOOL . . .

Saves countless hours of set-up time and greatly increases the productivity of the user.

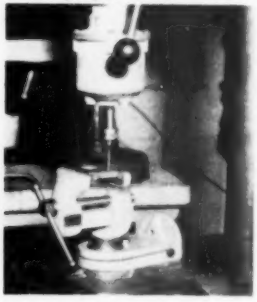
Dimensions: from base plate to top of jaws 9½". Opening of jaws 3", width of jaws 3". Diameter of ball 2½". Opening of surface grinding attachment 3"; height from base 3"; over-all O.D. 2¾" x 4½".

Complete set: Bench Vise, Drill Press Vise Plate, surface grinding and milling attachment, and slip-on jaw attachment (shipped prepaid in U.S.A.) . . $39.95

Complete unit, with working object, moved quickly from bench to drill press.

Portable for assembly or other work.

Vise transferred from drill press to tapping machine without removing object.



The surface grinding attachment shown here replaces the regular vise head by the simple unscrewing of one and the screwing on of the other.

ticed by many shops, to take about fifteen minutes at the end of the week to tidy up a bit so that things are ready for a good start on Monday morning.

Workers should clean up the dirt from their individual machines as they work, otherwise they will get careless and, naturally, the dirt will pile up. A good man wants to keep things orderly and clean around him. When one of the group of workers takes on the attributes of a pig and likes to wallow in the dirt, that is no excuse for condoning his actions on the grounds that he was not hired to keep his immediate work area clean.

From personal experience and common shop knowledge, I believe that a "clean-up" allowance of time is a good idea for improving working efficiency. This period, usually a few minutes before quitting time, is a good opportunity for enabling each man to clean up his immediate work area.

Where the practice is to have a clean shop, the quality of the product is usually better than in a dirty shop. Workers generally do a better job in clean working areas, and seek to keep them in clean and neat condition.

When each individual helps maintain a clean machine and an orderly work area, good housekeeping is not entirely dependent on the general sweepers and clean-up men. These men look after the entire shop; they should not be responsible for the individual worker's machine.

There was a neat little motto I once saw framed on the wall of a shop foreman's office. It read: "The day is not so short but that there is always time enough for cleaning up the work place." A good foreman as well as a good workman knows that there is only a short stretch between sloppy housekeeping in a shop and sloppy morale of the

"Aren't you carrying this private enterprise a little too far?"

Backstand Belts Triple Production!

Three times as many steel guides sanded per hour using ARMOUR Backstand Belts!

In sanding beveled edges of a steel guide for vending machines, a prominent company* decided to use backstand belts instead of set-up wheels. The switch *increased production from ten to thirty guides per hour!* Here is more proof that Armour backstand belts are more efficient, more economical than set-up wheels.

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workers in that shop. Cleanliness may be next to godliness, but a lack of it in the average shop may be next to lower production.

An efficient worker knows that shop housekeeping, safety, and fire prevention are closely interrelated. A weekly inspection by the foreman of each worker's immediate work area, conscientiously performed, with no axe to grind for or against any particular worker, should help bring the light to the man who does not want to accept responsibility for the cleanliness of his own backyard. The foreman should check the following items in the work area: are tools and supplies kept lying around; are material and tools in proper location; is the floor clean and clear of waste; are the general appearance and cleanliness of the worker's place up to standard? Are fire and safety hazards covered by adequate protective measures, or are corrective measures necessary? When this weekly housekeeping inspection is completed, any conditions necessitating correction should be remedied.

People seldom improve when they have no other model but themselves. When the new man sees how the rest of the workers keep their individual work areas clean, he will usually acquire the habit of cleanliness.

Modern management follows the policy of creating and maintaining working conditions which will make their factories good places in which to work. They provide personal conveniences, including locker rooms, washrooms and cleaning facilities, which will appeal to the self-respect of employees and aid in their general well-being. It is only fair that all employees cooperate in helping to maintain a clean and orderly shop by sharing individually in this responsibility.

Harry Kaufman
Philadelphia, Pa.

•

THERE SHOULD BE no satisfaction in following any custom when a better method comes to light. Chip removers and sweepers should be on hand when needed; the machine operator should not be hindered in his work.

It is standard practice in some shops, however, for the operator to clean up around his machine and at the end of the week to place whatever is collected in a pile in an aisle to be taken up by the ones assigned to the job.

My experience has been that best results are obtained when the op-

erator is required to keep his machine cleaned sufficiently to work properly at all times, and at the end of the week be responsible for its being in satisfactory shape in all respects so that another operator if desired, could be started on the job.

When the machine is a large one, it would require an extra hand to do this in the somewhat restricted time allowed at the end of the week.

Abel Blakeman
Watervliet, NY

•

THE IDEA of a machinist having to sweep the floor around his own working area is certainly a new one on me. I don't think the scheme is to be recommended on economic or sociological grounds.

Anybody can sweep a floor but not everyone can work a precision lathe or jig borer. Such skill is expensive in terms of both wages and overhead and is not to be dissipated in trivial duties like floor sweeping, which is a task performed easily by even the feeble-minded. No first-rate machinist is likely to relish the task of pushing a broom around the floor, even when he is paid double the normal rate of floor sweepers.

There are exceptions to the above rule, however. The most essential tool used by a shaping machine operator is a stiff push broom. If his machine is tearing off the material at an efficient rate, the chips will fly in all directions and finish up on the floor surrounding the machine where it will penetrate the shoe soles of all who walk by. For the sake of peace and general harmony, the shaping-machine operator should, therefore be equipped with a broom so he

"I wasn't sure whether the boss wore a toupee or not until I saw him look at that production chart!"

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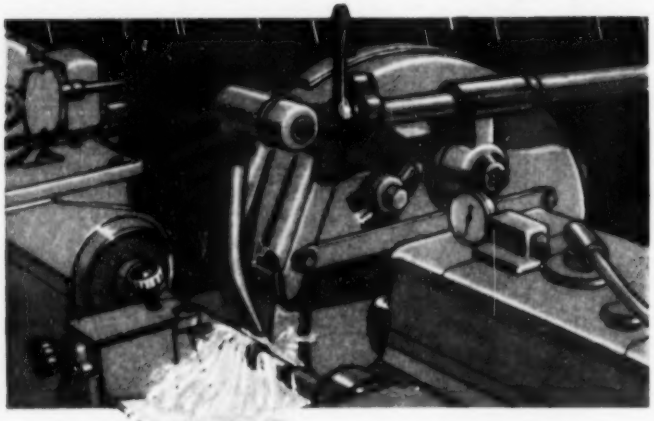

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Originators of Grinding Lubricants

can push the chips out of the gangway.

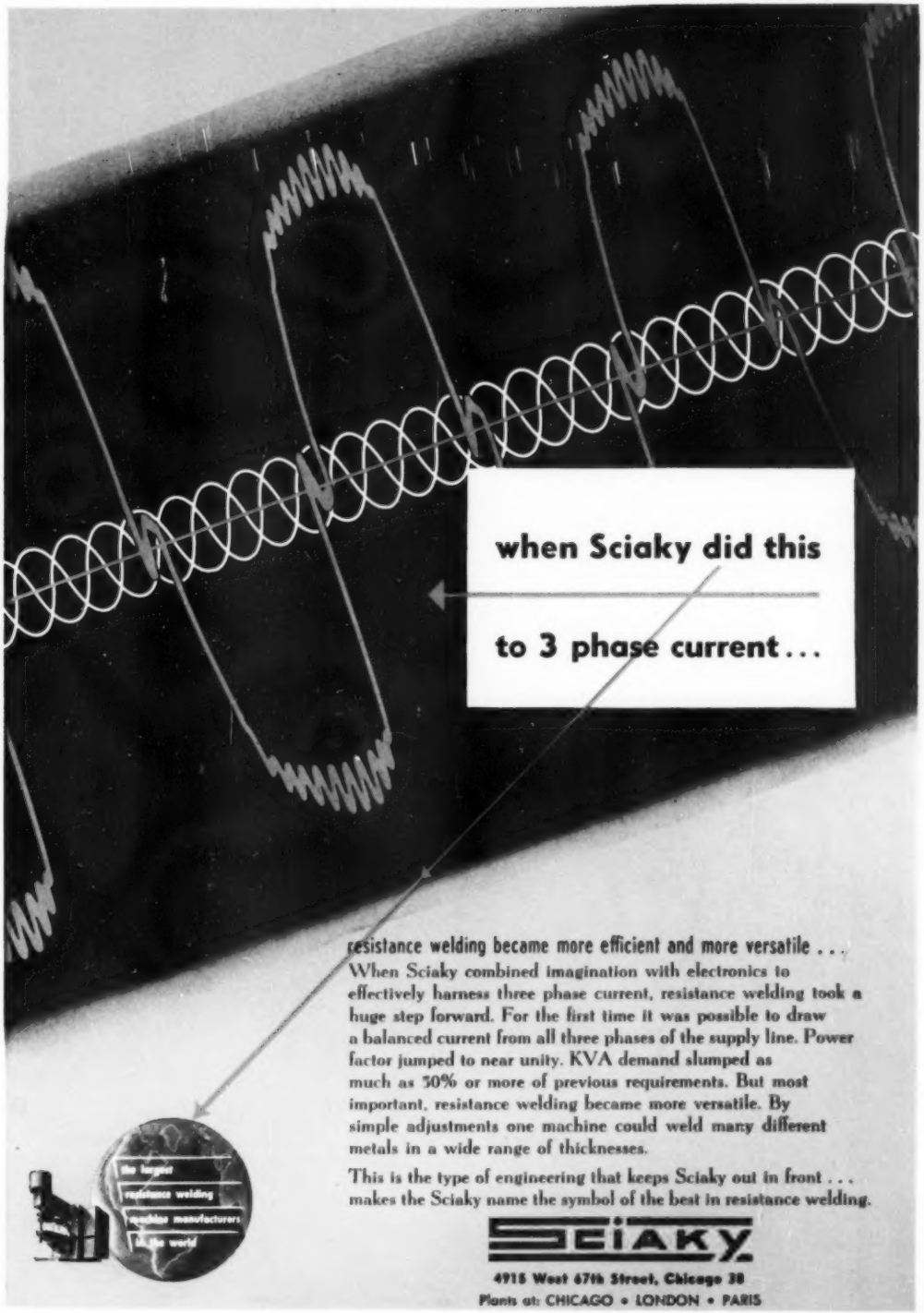
Apart from the shaper operator, I can think of no other machinist who should need a broom. When shop executives complain that the sweepers cannot keep up with their work, they are voicing a peculiarity which seems to afflict machine shop managements all over the world. I, personally, have never yet worked in a machine shop where the sweepers were keeping up with the dirt on the floor and I have come to the conclusion that this is due to a variety of reasons, the main one being lack of attention to detail.

In many small shops, floor sweeping is one of the duties performed by a character known in Britain as a laborer. There is generally only one laborer for the whole shop and he is usually the busiest bee in the place because he is not expected to stand in one fixed place and is at the service of everybody, from the head of the company to the youngest apprentice.

Any executive who wonders why his one laborer cannot cope with the floor-sweeping will be enlightened by the following list of duties performed daily by one of these handy men. The "inside" jobs that he is expected to do include cleaning out the lavatories, renewing toilet paper and towels, stoking the boiler for heating the plant, washing the windows, sounding the starting and knocking-off signals denoting shifts, operating a small electric shop crane, helping to load and unload trucks, painting finished machines and generally providing help in the shape of muscle to all and sundry.

"Outside" jobs are equally varied and include contacting the local bookmaker in order to place bets for the boys in the shop, buying newspapers and sundries, performing urgent shopping for the firm, wash-

"Remember—?" . . . The day the hose came off the air drill and darn near beat you to death before you could shut it off—?!



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"The Fox and The Stork"

points a moral to Cutting Fluid users

. . . with apologies to Aesop

The Fox was playing host to the Stork at dinner. Being a great prankster, he served nothing but soup in shallow dishes. The poor Stork got nothing to eat because he could get only the tip of his long bill into the soup.

The Stork reciprocated by having the Fox to a dinner at which he served delicious rice in long thin-necked jars. This time the Fox went without food because he couldn't even get his nose into the jar!

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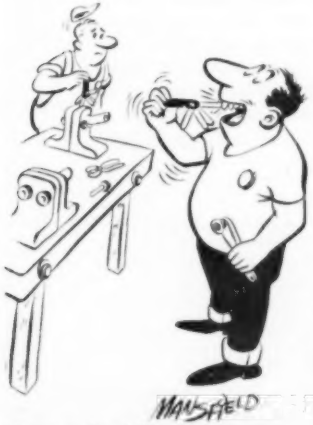
ing and polishing the manager's car.

It will be apparent from the above that the laborer of even the smallest shop has too much to do, but if it is suggested that an extra man be taken on just to help sweep the floor, the manager will laugh the idea to scorn. The laborer is nonproductive and is therefore hardly worth his hire. A keen manager should be wise to all the thousands of little tasks done by the laborer and should realize that these tasks are a big help towards the smooth running of the plant. The advocate of extra help could point out that the boss would get his car washed and polished more frequently if an extra hand were taken on, but this would probably be too tactless a remark.

It is alarming what a vast amount of productive time is lost in some shops owing to machinists waiting for help from the laborer. Shops which have strong trade union representation have strict rules about machinists doing laboring work. One machinist cannot help another to change heavy lathe chucks, for instance. The help must be provided by a laborer. Any machinist handling a broom in such a shop would precipitate a strike.

The cleaning duties of a machinist should be confined to maintaining general tidiness of the working place, keeping the machine clean, together with the ancillary tools and equipment. One shop of my experience carried cleaning by specialists to extreme lengths. The machinist put his tools away at the end of a shift and walked away from the machine leaving chips, dirt and all. During the night, the maintenance crew came around and cleaned and oiled the machine. This was all very well in theory but did not prove



"Forgot my dental floss again!"

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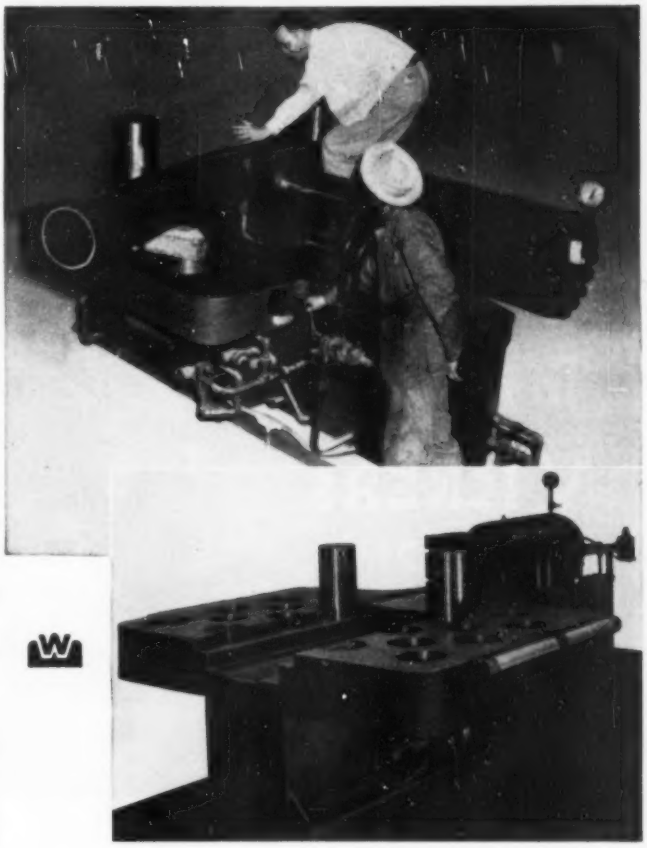

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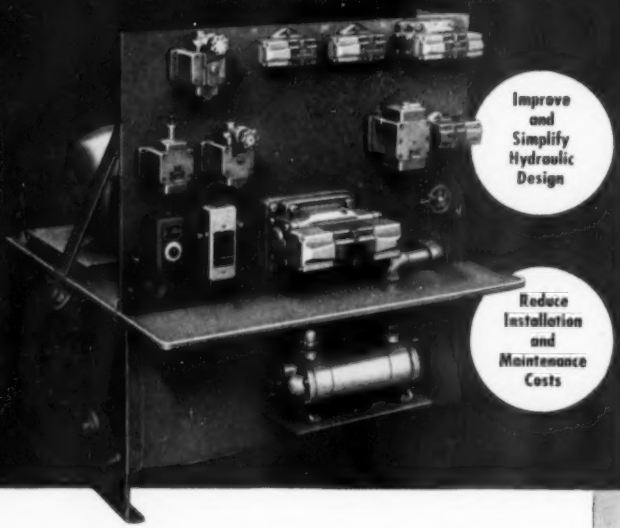

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very practical as the supervision of the cleaning crew appeared to be poor, and the machine-cleaning was very sketchy. All the machine operators gave their equipment a thorough wipe-over before starting in the morning. A big trouble was that the management did not equip us with oil cans, since they were so proud of their night-time cleaners and oilers. It was very difficult to get hold of an oil can so that the ways of the machines could be oiled to replace the film of grit and grease left on them by the cleaning staff. A lot of time was wasted by the machinists as a result of this crackpot policy.

Managements should analyze the duties performed by their non-productive laborers to insure that they are not overloaded, thereby impeding shop cleanliness and efficiency. Machinists should be discouraged from broom-pushing so that they can get on with the work for which they are paid.

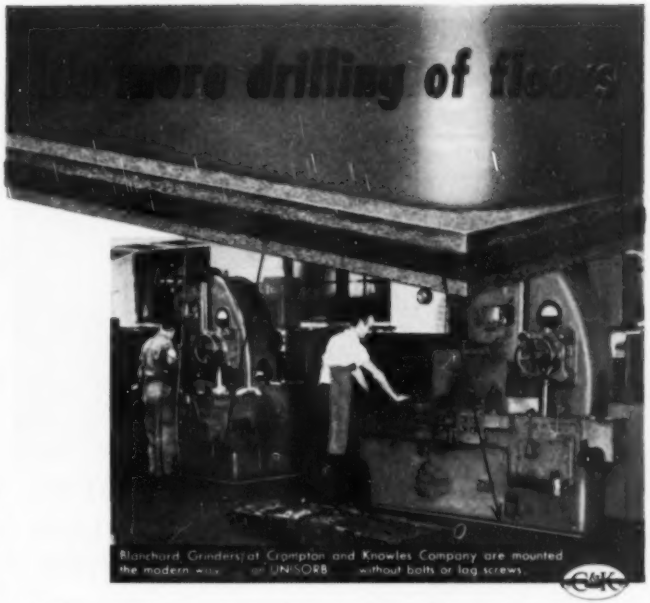
Clifford T. Bower
London, England

•

THE QUESTION OF good housekeeping is always one which interests many people. All individuals who have made a study of working conditions know that the housekeeping a person does is usually indicative of the quality of his work.

Now, it is further realized that certain environments must be present in order to encourage good housekeeping. One must be supplied with an adequate work area and an area that is, or originally was, well designed to do the job. Makeshift arrangements do not inspire individuals to keep the place picked up. So we see that first of all it becomes the company's duty to place at the command of the workers a suitable, well-designed working area having a good appearance. Then it is the worker who is responsible for the area.

"That happens everytime they give Bernie a change in specifications."



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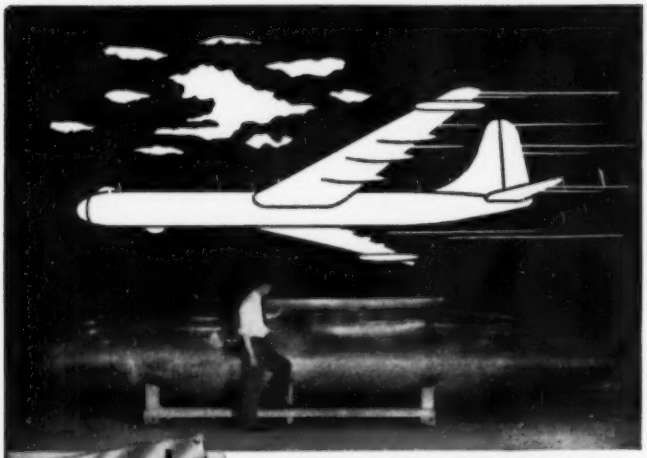

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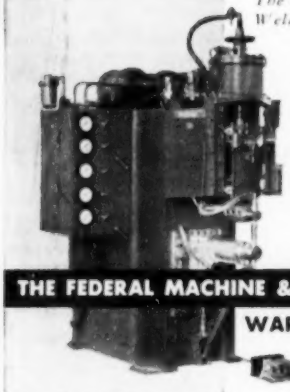

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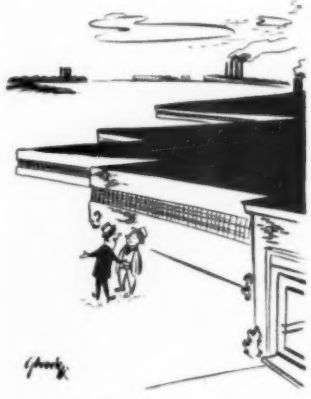
Conditions regarding the policy of the company, the financial position and the supervision are also vitally important in this discussion. If the company policy is to let things "go to pot" then no one can expect the worker to care about keeping his own working area up. Should the financial picture be such that the company can not actually afford to do the job in the right manner, but is willing to go more than half way, then the responsibility lies with the superivison—which is the third point. Supervision can sell ideas to the workers. They can direct the individual's thinking.

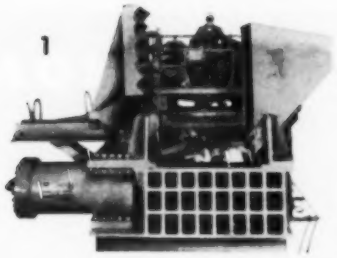
When problems such as Al is confronted with come up, it requires an understanding with the new worker. Perhaps the new man hasn't been used to cleaning up equipment. Maybe his ideas are better than the present method. All these things must be weighed with an open mind, and considered carefully by the supervisor. Then he must act. Either he must set forth the policy of the company, or he must sell his new idea to higher management and get a new system started. Naturally the easy way is to let things go, but when 15 minutes each Friday is taken by the entire shop, that may cost more money than the employing of a sweeper, at a lower-per-hour rate, and having him do the work on off-shift operation.

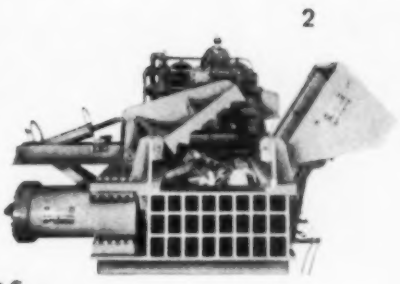
The worker is naturally expected to maintain a working area, but the difference between this and the cleaning up of chips, the cleaning off of the entire machine, or the cleaning of the shop as a whole, are different problems.

First, a good worker and one who



"Big layout? Listen: we have to call long distance to get the front gateman!"





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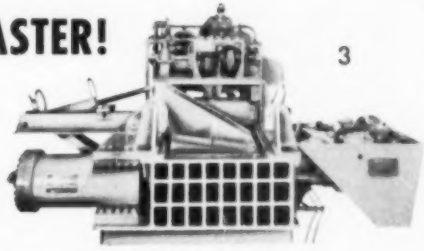

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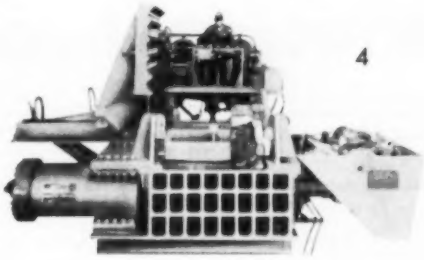

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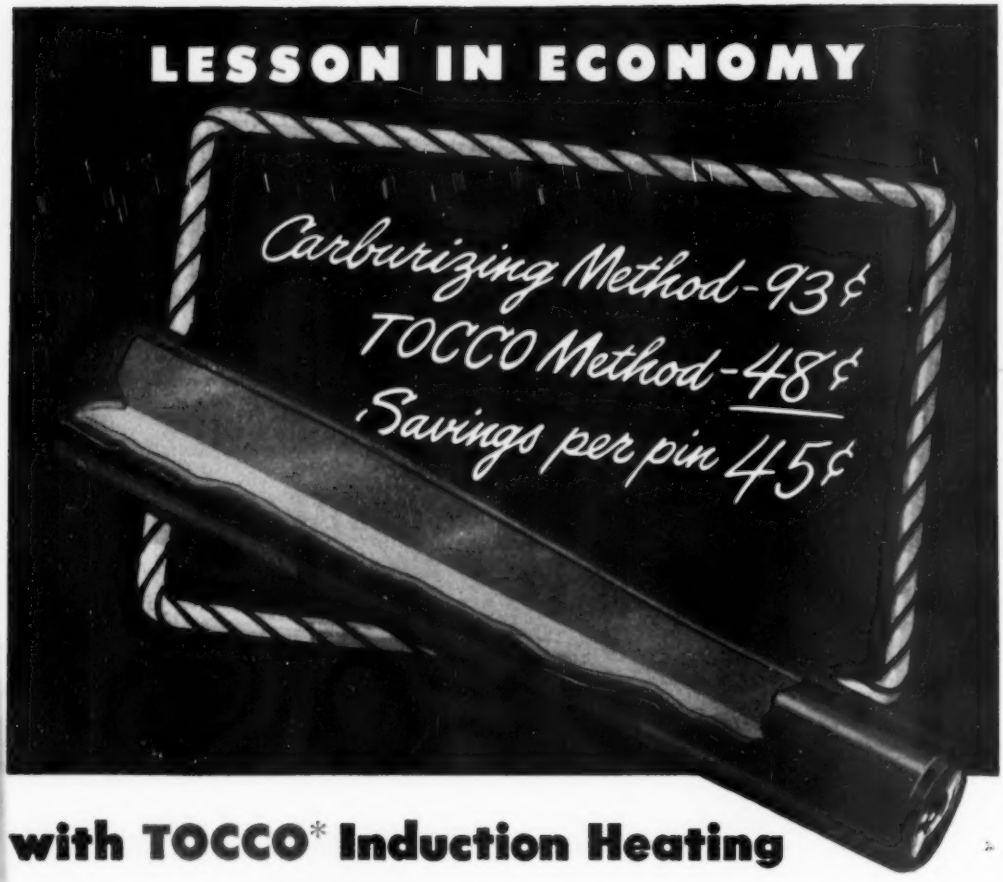

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● When a leading motor truck manufacturer switched to TOCCO for surface hardening steering knuckle pins, they not only cut the cost of the part in half, but reduced heat-treating time from 17 hours to 48 seconds!

● Using TOCCO they were able to combine two operations and eliminate four others completely. Moreover, the TOCCO unit, being located right in the production line next to related operations, saves approximately 4000′ of hauling to and from the heat-treat department – an important economy factor not included in the above figures.

● If your operations involve the hardening, brazing, soldering, melting or forging of ferrous or nonferrous metals, TOCCO can probably speed up *your* production and lower *your* costs, too. Why not ask to have a TOCCO engineer survey your plant for similar cost-cutting results—without obligation.

SEND OUR CATALOG IN

THE OHIO CRANKSHAFT COMPANY • CLEVELAND 1, OHIO

TOCCO

Induction Heating Equipment must meet the requirements of the Federal Communication Commission's Rules and Regulations Relating to Industrial, Scientific and Medical Services, Part 18. All TOCCO equipment is certified to comply with these rules and regulations.

really knows his trade (we are now speaking of machinists) can work an entire week without even getting a white coat or apron dirty. How do they do it? Certainly not by having messy working areas or dirty tools.

No, our foremen are too apt to take the easy way out. They are prone to use the old way which they perhaps inherited when they took over. We must teach our first line of management to think and to act on new methods. The trend, naturally, is to get more productivity from those who are paid to produce. A cleaner cut between direct and indirect labor must be maintained. Today selling prices are again competitive and a company must keep more accurate cost records. Less indirect labor such as machine cleaning must be had by direct labor who is being paid premium wages.

Ed is certainly right—get a sweeper and keep the machinist working. It will pay dividends.

Charles D Townsend
West Hartford, Conn

NEW BOOKS

SIXTY POWER TOOLS AND HOW TO BUILD THEM—*Published by Popular Mechanics Press, 200 E Ontario St, Chicago 11, Ill. 144 pages. Price $2.50.*

A useful how-to-do-it book for the home craftsman that gives detailed instructions and drawings for building small power tools from wood and scrap. Tools include jigsaws, bandsaws, sanders, hacksaws, circular saws, planers, drillpresses, and a variety of similar equipment. This is a worthwhile addition to the amateur craftsman's library.

•

WORKSHOP PRACTICE *(9th edition of E Pull's Modern Workshop Practice). Revised by P S Houghton. Published by The Technical Press Ltd, Gloucester Road, Kingston Hill, Surrey, England. 739 pages. Price 24/6.*

An old and well established book that covers the whole gamut of machine shop operations and is of value to apprentices and students, as well as to more experienced machinists.

Unfortunately, the revision leaves much to be desired and now forms a curious mixture of old and new. For example, treadle-operated and

30% PRODUCTION SAVINGS... with Jewel Brand Coated Abrasives!

BY SWITCHING TO JEWEL BRAND resin bonded abrasive belts, a manufacturer of cold rolled steel boxes for tools, first aid kits, electronic parts and similar equipment, made production savings of 30% in removing welding beads.

SAVINGS LIKE THESE are possible because properly chosen Jewel Brand Belts cut faster, last longer. And all Jewel Brand Coated Abrasive Belts have the exclusive *Velvet Joint* that eliminates bumping, adds many hours of productivity.

HELP YOURSELF TO SIMILAR SAVINGS by making the simple Waste Barrel Test. Send us a letter size sample (preferably including the joint) of a used belt taken from your waste barrel. In most cases, Jewel Brand Engineers can recommend a Jewel Brand Coated Abrasive Belt that will save time and money for you! No obligation of any kind.

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NAME _____

POSITION _____

COMPANY _____

TYPE OF PRODUCT _____ MATERIAL _____

WE USE APPROXIMATELY _____ BELTS PER MONTH _____

BELT LENGTH _____ BELT WIDTH _____

For repetitive cutting . . .

THIS COMBINATION SAVES TIME AND MONEY

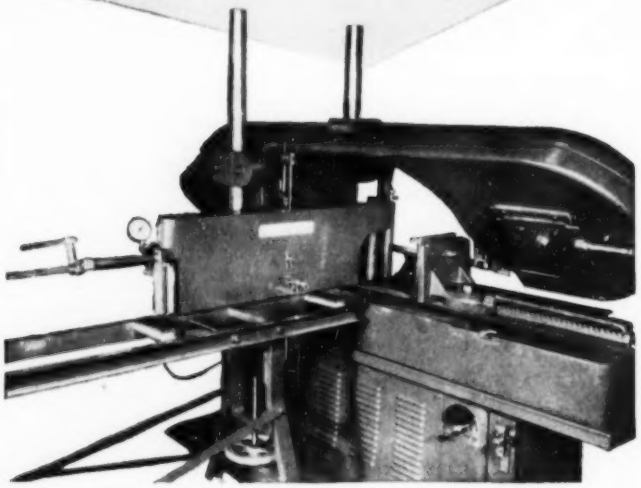
Wells No. 12 Metal Cutting Band Saw and *Wells-O-Bar* Feed Master

ANY quantity of identical lengths of bar stock are cut automatically in a Wells No. 12 Heavy Duty Metal Cutting Band Saw equipped with a Wells-O-Bar Feed Master.

In operation, the cutting head of the saw descends at a rate governed by a predetermined blade pressure setting. At the completion of each cut, the head automatically rises to a preset height and the stock is automatically projected for the next cut. The machine requires no attention except for reloading. The saw is powered by two electric motors (3/4 and 1/3 H.P.); the feed requires air at 60 to 80 psi. Capacity of the saw is 12¾" O.D. for rounds, 12" x 16" rectangular; standard feed will project up to 17".

The feed mechanism does not interfere with the use of the saw for making single cuts. Saw and feed can be purchased separately or as a combination. The feed unit can easily be attached to horizontal band saws now in service.

Ask your Wells Dealer for complete information or write direct.



Wells Saws

Wells

The Pioneers of Horizontal

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
505 ROOSEVELT RD., THREE RIVERS, MICHIGAN

flat-belt-driven lathes are still shown as standard equipment. Many of the half-tones are muddy and, like many of the pages, were apparently printed from the original plates which are virtually worn out. Even some of the line drawings are badly printed, and were drawn without consideration of the amount of reduction, so the lettering cannot be read. The new material is printed in a different type from the old.

The book serves its purpose well enough, but the publishers would be well advised to make a complete rather than a partial revision and to pay more attention to the quality of the printing.

•

TENTATIVE SPECIFICATIONS FOR COPPER AND COPPER-ALLOY WELDING RODS—*Published by American Welding Society, 33W 39th St, New York 18, and American Society for Testing Materials, 1916 Race St, Philadelphia 3, Pa. 13 pages. Price $0.40.*

This new set of specifications covers copper and copper-alloy welding rods for oxyacetylene, carbon arc, and inert-gas metal-arc welding. Materials covered include copper, silicon bronze, phosphor bronze, copper nickel, naval brass, manganese bronze, low-fuming bronze, nickel bronze, and aluminum-bronze welding rods. Specifications give the chemical composition, mechanical properties, and usability characteristics of each classification, with corresponding tests for verifying these properties.

An appendix serves to aid users in selecting the best welding rod for their need and using it in the most efficient way.

"How indecent! Stripped threads!"

NAMES in the NEWS

Harry Day

Harry Day has been appointed vice president and general manager of Link Welder Corp. Mr Day joined the firm as chief engineer; he was subsequently made plant manager, and was serving as general manager at the time of his appointment.

H L Weinberg has been appointed director of engineering for American Locomotive Co; he succeeds **John Thomas,** assigned to the administrative staff of the vice president.

George F Shaver has been appointed sales manager for Pacific Airmotive Corp's Seattle branch. **J M Craig,** formerly associated with Pacific Equipment Co, will succeed Mr Shaver as merchandise sales manager in Burbank.

Theodore Skol has joined Abbott Screw & Bolt Co, Chicago. He will serve as assistant sales manager, the same post he has held for the past ten years with Stronghold Screw Products.

James E Gannon has been appointed field engineer in the product development department of Weber Aircraft Corp, Burbank, Calif. He was formerly associated with Lockheed Corp.

Edward L Stehle has been named southeastern district manager of General Electric Co's major appliance division. Mr Stehle, who joined the company in 1946, moves up from his post as manager of the Pittsburgh office, to which he was appointed in 1949.

Irving August has been appointed assistant to the works manager of Worthington Corp's Holyoke, Mass, plant. **Merril Berman** will succeed Mr August as supt of the company's Denver, Col, plant.

Don't Let Gear Worries Spoil Your Sleep

When you require gears having either very close or wide tolerances, consult Vinco. Their "Metalworking Wisdom" is your assurance that all gears will be delivered as specified, and generally at lower cost.

• • •

Vinco mass produces parts and assemblies; is the source for gears, splines, engineering and designing.

A few of the close tolerance, turbo jet gears ground by Vinco.

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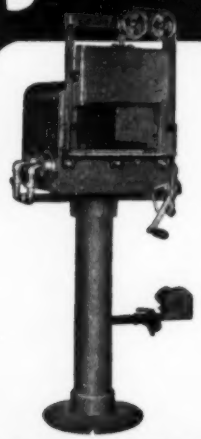
Pete's right, men! It will pay us to use good tool steel!

COLUMBIA TOOL STEEL COMPANY • CHICAGO HEIGHTS, ILL.

Producers of fine tool steels—High Speed Steels
Die Steels—Hot Work and Shock Resisting Steels
Carbon Tool Steels.

TOOL COLUMBIA STEELS

SAVE HOURS
CUT COSTS



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With Quick-Acting JOHNSON Furnaces

Save time, save gas... heat treat carbon and high speed steel tools and dies with JOHNSON No. 130A. Two sizes offer wide temperature range. Powerful burners provide fast, uniform heat with time saving speed. Temperatures are easily controlled with accuracy. The counter-balanced door opens upwards. Firebox 7" x 13" x 16½". Complete with Carbofrax Hearth, G. E. Motor and Johnson Blower. Write for Complete Catalog. Johnson Gas Appliance Company, 589 E Avenue N. W., Cedar Rapids, Iowa.

JOHNSON No. 130A Hi-Speed
For temperatures 1400° to 2350° F. $295.00
For temperatures 1800° to 2400° F. $325.00
F.O.B. Factory
Models also available in smaller firebox sizes.

JOHNSON
Since 1901
FURNACES FOR INDUSTRY

George A Park has been named manager of distributor sales for Norton Co; he was formerly eastern region sales manager. **Donald L Price,** formerly sales manager, central region, will take over Mr Parks area, in addition to his own territory.

Carl E Johnson has been appointed chief engineer of Scaife Co, Oakmont, Pa.; he has been associated with the company for the past 19 years. **James S Shuster** has been appointed product engineer, pressure vessel division.

H C Cranfill has been appointed assistant to the vice president, operations, at Columbia-Geneva Steel Div, US Steel. He succeeds **R B Freeman,** who has been transferred to the Pittsburg, Calif, foundry, where he will serve as project manager for the rehabilitation and operation of the plant under a US government contract. Mr Cranfill has been serving as vice president of Consolidated Western Steel Corp, US steel subsidiary.

Richard W Banfield has been elected a vice president of Niles-Bement-Pond Co, West Hartford, Conn, Pratt & Whitney and Chandler-Evans Divs. Mr Banfield will continue to carry on his duties as treasurer. **David R Anderson** has been appointed controller.

A O Williams

A O Williams has been appointed director of engineering, Industrial Truck Div, Clark Equipment Co. Mr Williams, who became associated with the organization in 1917, has been engaged in new product research in the department which he will now head.

Joseph P Somers has been appointed assistant to the president of Wyckoff Steel Co. He formerly served as assistant to the vice president in charge of the company's eastern region in Philadelphia.

Assembly Problem?

Use Black & Decker Screw Drivers for faster work, tighter assemblies, fewer rejects, less operator strain!

New No. 12 Positive Clutch SCRUGUN*

WHATEVER your assembly problem . . . pick the tool with the *correct* power, speed and capacity to solve it . . . from the big, diversified Black & Decker Screw Driver Line! Choose from 21 models for driving everything from No. 4 screws to $\frac{5}{8}$" diam. nuts . . models with positive clutches for "free-hand" driving . . . with adjustable clutches for driving to uniform, predetermined tightness . . . with 90° angle heads for working in close quarters or around corners.

Heft a B&D Screw Driver and see why its balance, compactness and light weight mean easy handling. Pull its trigger switch and feel the surge of power that spells top-speed performance. Check its quality-built features and get the reasons why it turns out accurate, uniform work. See your nearby Black & Decker Distributor for a demonstration, for expert help on any assembly problem. Write for free catalog to: THE BLACK & DECKER MFG. CO., 604 Pennsylvania Ave., Towson 4, Maryland.

BLACK & DECKER 33 Factory Branches SERVICE

. . . use them to save time, trouble, money!

*Trade Mark Reg. U. S. Pat. Off.

FOR *Strictly* IMPERSONAL INSPECTION CHOOSE AMES DIAL COMPARATORS

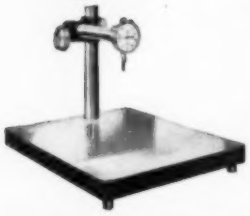
Ames Dial Comparators make the inspection of duplicate parts an extremely simple, rapid and accurate operation. Ames Comparators are strictly impersonal in their accuracy — the results being in no way dependent on the skill or judgment of the operator. The pressure of the gauging members against the work is mechanically determined and therefore uniform.

Check the Ames Dial Comparators shown — one of them may solve a Quality Control problem for you.

Ames No. 1 Dial Comparator is an easily adjustable bench model that measures objects up to 2" in cross section. The table bracket may be quickly located and locked in position on the column. The table itself may be further positioned and locked for final fine adjustment. This comparator is designated *Ames No. 1W* when equipped with dead-weight contact pressure and contact area to ASTM specifications for measuring resilient materials, such as rubber, plastics, etc.

Ames No. 2 Dial Comparator is a compact, stable bench model for measuring non-yielding materials — sheet metal, glass, hard rubber. The 2" diameter table is adjustable to bring pointer to zero. *Ames No. 2W* is similar to the Ames No. 2, but is furnished with dead-weight contact pressure and contact areas to ASTM specifications for checking textiles, plastics, sheet rubber, etc.

Ames No. 13 Dial Comparator features flat-ground, cast-iron base of ample size for using V-blocks and locating fixtures for checking rounds, flats and odd shapes. Also, the No. 13 can be fitted with a fine adjustment for close setting. Accurately adjustable bracket holds any Ames Micrometer Dial Indicator.



Ames No. 130 Dial Comparator is designed especially for inspecting comparatively large parts. For this reason, the flat-ground steel base, the adjustable indicator support on which can be mounted any Ames Micrometer Dial Indicator, and the upright column are proportioned to suit the user's particular requirements.

Send us your Quality Control job specifications, and we will supply complete details and proposal without obligation.

Representatives in principal cities. **B. C. AMES CO.** 26 Ames Street, Waltham 54, Mass.

Mfgr. of Micrometer Dial Gauges • Micrometer Dial Indicators

T J Newcomb has been appointed manager of Westinghouse Corp's Television-Radio Div, with headquarters at Sunbury, Pa. Formerly sales manager of the Appliance Div, Mansfield, Ohio, Mr. Newcomb succeeds **F M Sloan**, named manager of operations for Television-Radio. **Ray H Timmons** has been named manager of the Co's Steam Div; he was formerly manufacturing manager for industrial products. **Victor D Kniss** has been appointed general sales manager of consumer products.

P B Terhorst has been appointed works manager of the Grantley plant of York Corp. Mr Terhorst joined the firm in 1949 as assistant supt, and has most recently been serving as supt of the Grantley plant.

Harold C Smith, Jr, has been named manager, rail and government sales, of Carborundum Co. Prior to his appointment, Mr Smith served as manager, central zone, of the company's recently-established merchandising sales division.

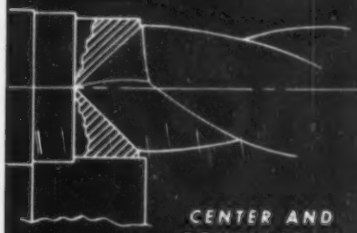
Robert L Halsted has been appointed manager of Allis-Chalmers central region with headquarters in Cleveland. Mr Halsted succeeds **P F Bauer**, recently named general manager of the company's Norwood, Ohio, works, and manager of the apparatus department. Mr Halsted, who has been a member of the firm since 1935, and manager of its Cleveland district office since 1948, will be succeeded by **Joseph Bronaugh**, former manager of the Miami office.

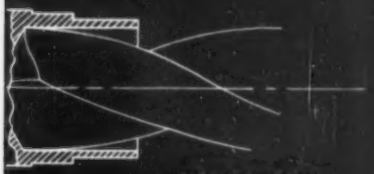
E E Valy has been appointed distributor sales manager for Illinois Tool Works' Illinite standard cutting tools. Mr Valy has been associated with the firm for 33 years; he will make his headquarters at the company's Chicago plant.

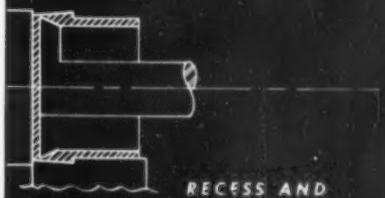
William O Murray has been named industrial sales engineer for the Parker Appliance Co, Cleveland. Mr Murray, who will make his headquarters in Pittsburgh, joined the firm two years ago.

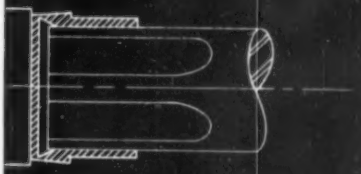
John G Dun has been appointed chief metallurgist of Republic Steel Corp's Warren district; he succeeds **James J Bowden**, resigned. **Walter M Edwards**, formerly chief inspector, has been advanced to the post of supt of steel conservation and quality control.

Harold Helbock has been named production manager, Pastushin Aviation Corp, Los Angeles, and **R E Vannaman**, personnel manager.









Good coolant practice makes machining aluminum easy

If your tools dull quickly, your work runs hot or chips pile up in the tool zone, check your coolant.

Be sure you are using an adequate volume of coolant consistent with operating conditions. Keep the nozzles open. Direct the coolant stream to hit the work and tools, at the proper angle. Chips should be washed away to prevent fouling the tools. Use a good cutting fluid. Special aluminum coolants generally consist of light mineral oil with 5—10 per cent fatty additions. Viscosity should be 45 to 65 seconds at 100° F on a Saybolt Universal Viscosimeter. Flash point should be above 270° F.

Your local Alcoa sales engineer will gladly answer your questions about coolant practice, alloy selection and machining. You'll find him listed under "Aluminum" in your classified phone book.

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ALCOA OFFERS TWO BOOKS — *Alcoa Aluminum in Automatic Screw Machines*—a 95-page book containing information on tool design, setup and operating techniques.

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Industrial Gears and Speed Reducers
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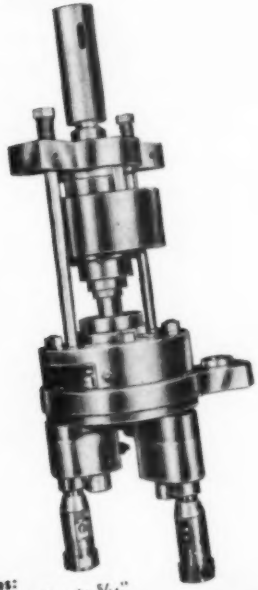
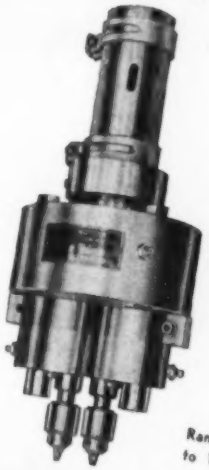
THE RIGHT COMBINATION TO CUT DRILLING AND TAPPING COSTS

ERRINGTON *Adjustable* TAPPING HEAD



Sizes:
#0-#10 Tap to 5/16"
#1-3/16" Tap to 1/2"

ERRINGTON *Adjustable* DRILLING HEAD



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Here are versatile tools which permit you to take advantage of a wide range of adjustment—without overhang. Supplied with 3 spindles for equal adjustment in line and 3, 4, 5 or 6 spindles for equal adjustment on bolt circles.

Features: Fully geared. Needle bearings on all spindles in head. Ball thrust bearings throughout. Bronze bushed. Sand cast aluminum case. All parts fully enclosed for pressure lubrication and protection. Non-slip positive clamping on all adjusting members.

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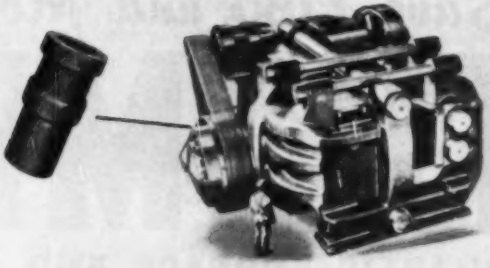

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NATIONAL'S all-around experience covers the full range of forging—hot and cold, large and small, ferrous and non-ferrous.

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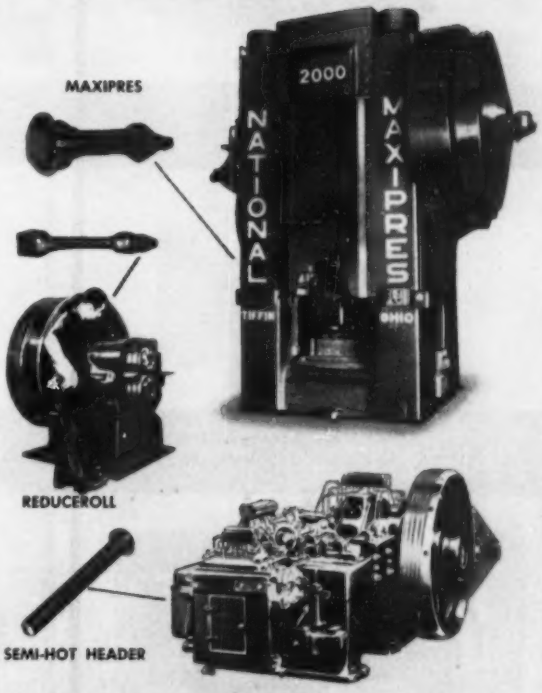

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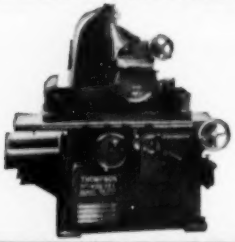
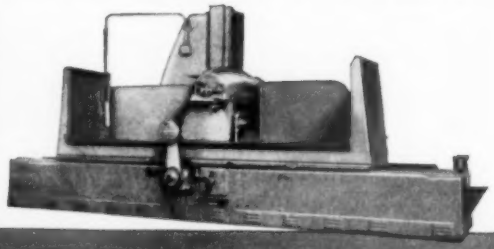
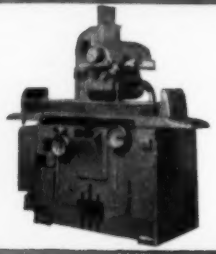


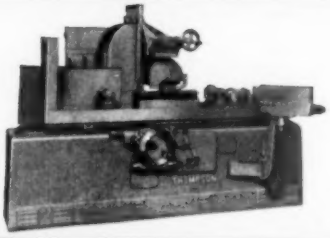
TYPE B Small General Purpose Grinders sizes from 6x18x30 to 20x48x120



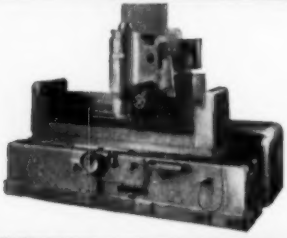
TYPE C & CX Medium and Heavy Duty Grinders sizes from 20x48x60 to 36x96x240



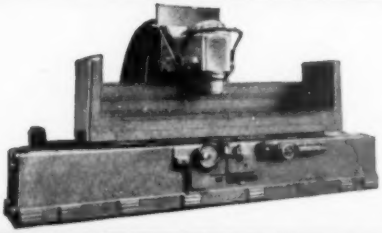
TYPE F Tool Room Grinders available in sizes 6x18x12 and 6x18x24



TYPE B & C TAUFORM Contour Grinders for all shapes sizes 20x48x30 to 36x96x84



FIXED COLUMN VERTICAL SPINDLE Production Surface Grinders sizes 12x24x18 to 24x60x120



HYDROVERT Two wheel vertical or semi-vertical surface sizes 24x60x18 to 60x240x192

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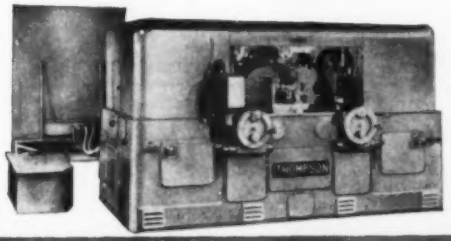
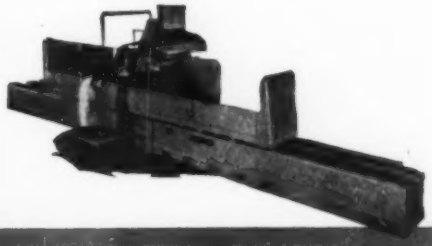
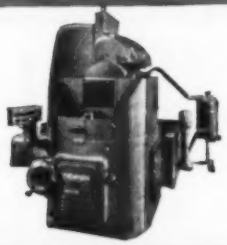


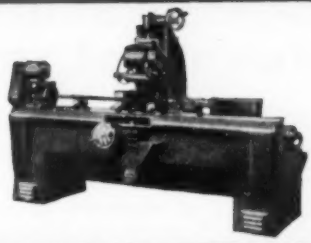
DOUBLE WHEEL BUCKET AND BLADE GRINDER



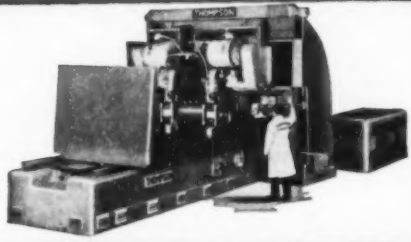
WAY GRINDERS



TWIN CHUCK ROTARY GRINDER



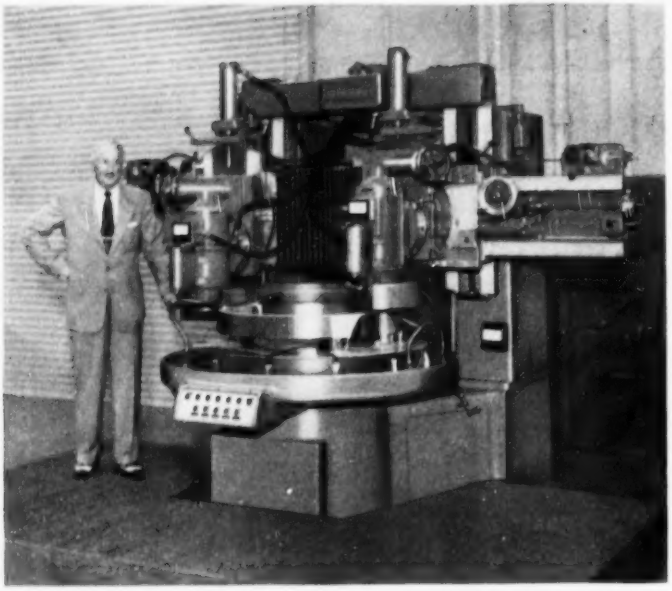
NEW SERIES 600 MANUAL BROACH GRINDER



RAIL TYPE HYDRAIL

Thompson SURFACE Grinders

The Thompson Grinder Co., Springfield 1, Ohio



1800 Series Frauenthal Multiple-Head Super-Precision Cylindrical Grinder

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With Frauenthal Grinders you can grind big diameters, up to 140 inches, to the extremely close tolerance of .000200" (200/millionths of an inch) in concentricity, parallelism and roundness. Uniformity of precision is assured. Investigate Frauenthal Multiple-Head Super-Precision Cylindrical Grinders.

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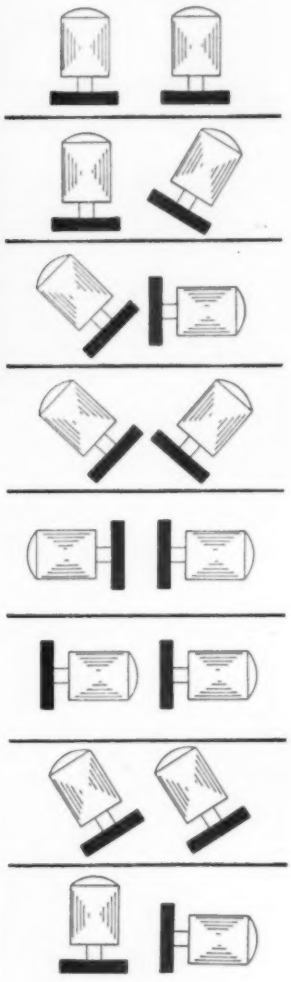
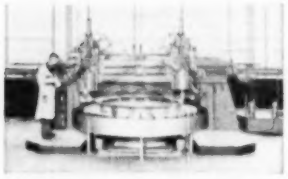
TABLE SIZES	30"	36"	42"	48"	60"	72"	100"	120"	130"	140"
MAXIMUM SWING	56"	56"	56"	56"	72"	88"	120"	130"	140"	150"

MANY COMBINATION SETTINGS for simultaneous grinding with Frauenthal Grinders

The diagrams below show a few of the many combination settings of Grinding-Spindle positions, suggesting the great versatility of these unique grinders:





◀ *2200 Series Frauenthal Grinder*

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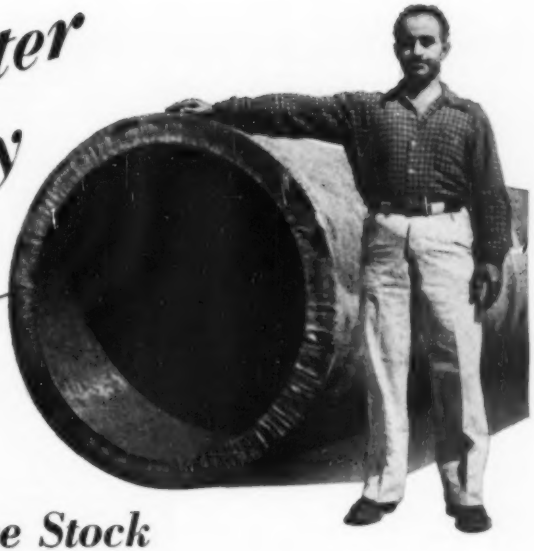
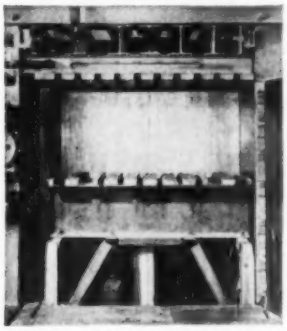


Available from FRASSE Warehouse Stock

ACIPCO steel tubing, centrifugally cast, is now available from Frasse in sizes ranging from 2″ to 50″ O. D., wall thicknesses of ¼″ to 4″, in lengths up to 16 feet. The more popular sizes are immediately available from stock. Other sizes and analyses (in quantities as little as 16 feet) can be made to order promptly.

Government, ASTM, AMS, ABS, ACI and AISI specifications can be readily met. ACIPCO tubing is made in any standard or non-standard analysis. Steel used in its manufacture is produced in electric furnaces.



Fabrication of this hydraulic baling press required a 22'6" ram of AISI *1030*, and a 21'6" cylinder of AISI *1025*. ACIPCO tubing, circumferentially welded to proper length, was used successfully for both items. The manufacturer, Consolidated Baling Machine Co., relied on Frasse to furnish ACIPCO tubing in the size, length and analysis needed.

Typical applications for ACIPCO tubing include: Hydraulic cylinders, ship propulsion shafts, cracking still tubes, retorts, and paper mill rolls. In addition, it has received wide recognition as a component in weldment applications. Why not investigate the many advantages offered by this versatile product?

Frasse Engineering Memorandum #11 covers in detail the characteristics, properties, analyses and pertinent facts about ACIPCO centrifugally cast steel tubing. Mail the coupon below for your free copy today.

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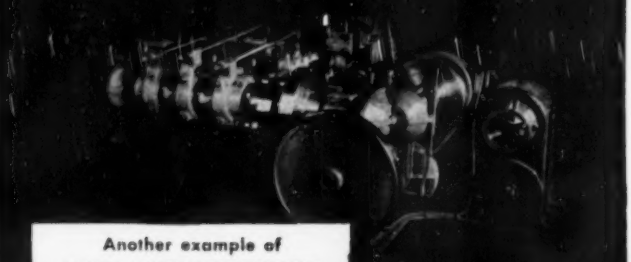

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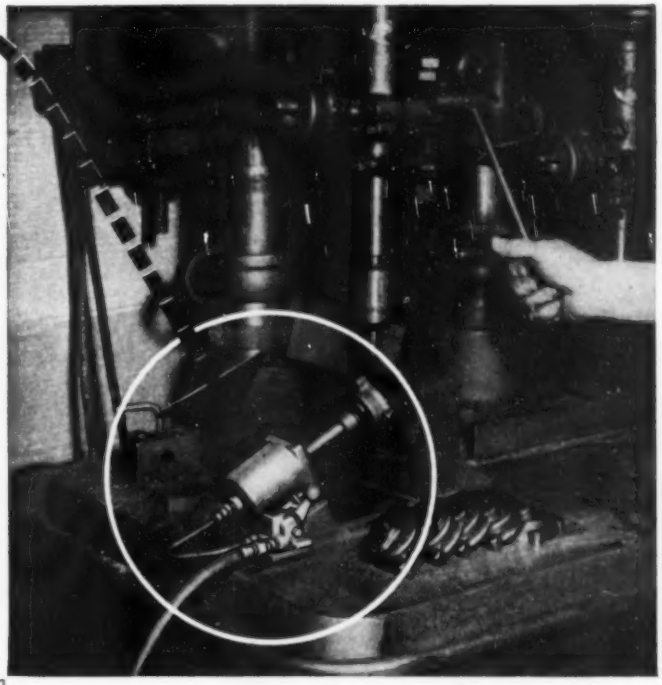

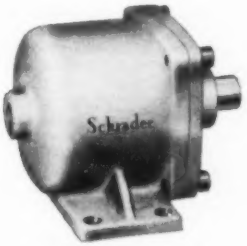

ClampAir Cylinder

Watch a worker making ready for a simple drilling operation. He places the work in a fixture and hand-clamps it. With everything all set to go, you'll find he takes as much as ten seconds just to grip the work tightly in the clamp.

Multiply that by thousands of machining operations in a normal high production shop. You'll find a substantial portion of work time is used up before actual production is begun.

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The ClampAir is actually a bantam air cylinder, with plenty of power to hold work firmly in place—with the same holding force every time. That means the end of rejects caused by inconsistent holding forces.

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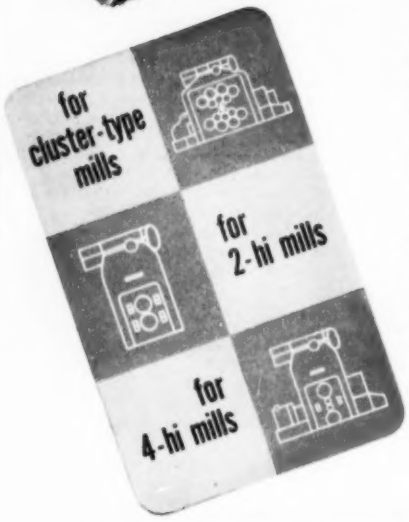

● Here's the magic key to improved surface finish, more uniform gauge and closer tolerance on all types of cold-rolled metal strip. Whether you require an ultra-mirror finish or just a plain, smooth surface—work rolls of Talide (Tungsten Carbide) are the answer. Only Metal Carbides has the know-how and experience to produce carbide rolls from 1 pound laboratory size up to 1,000 pound production mill rolls.

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Talide Rolls are designed to help the metalworking industry produce more efficiently—in less time—at lower cost.

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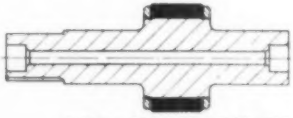
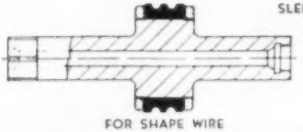


SLEEVED ROLLS FOR FLAT WIRE



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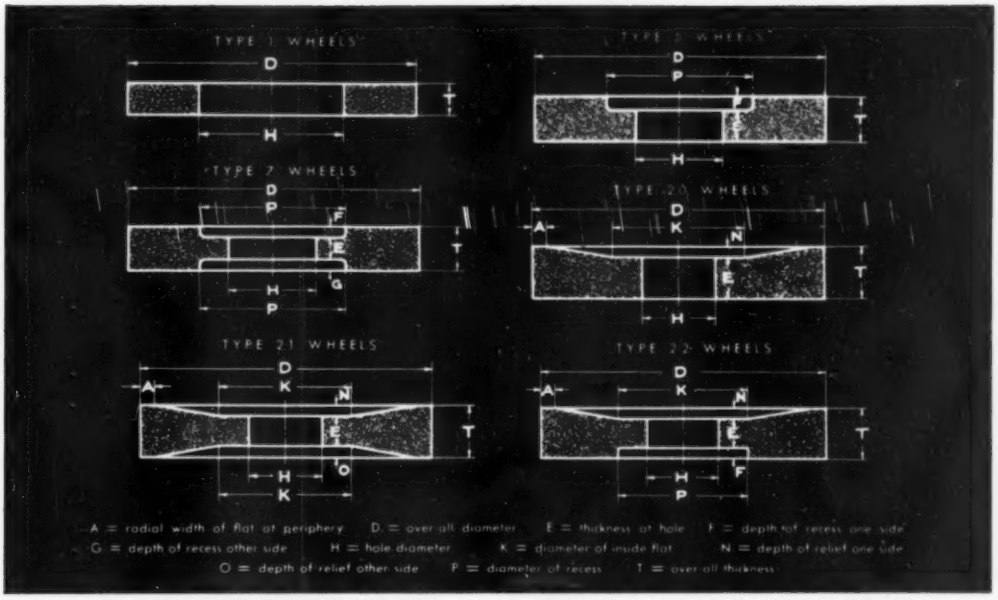

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YOU'RE SURE YOU'RE RIGHT when you check your wheels against the simple standard charts in the bulletin "Standard Shapes and Sizes of Grinding Wheels." If you already have a copy, consult it. If you haven't, check the coupon below, and mail it today.

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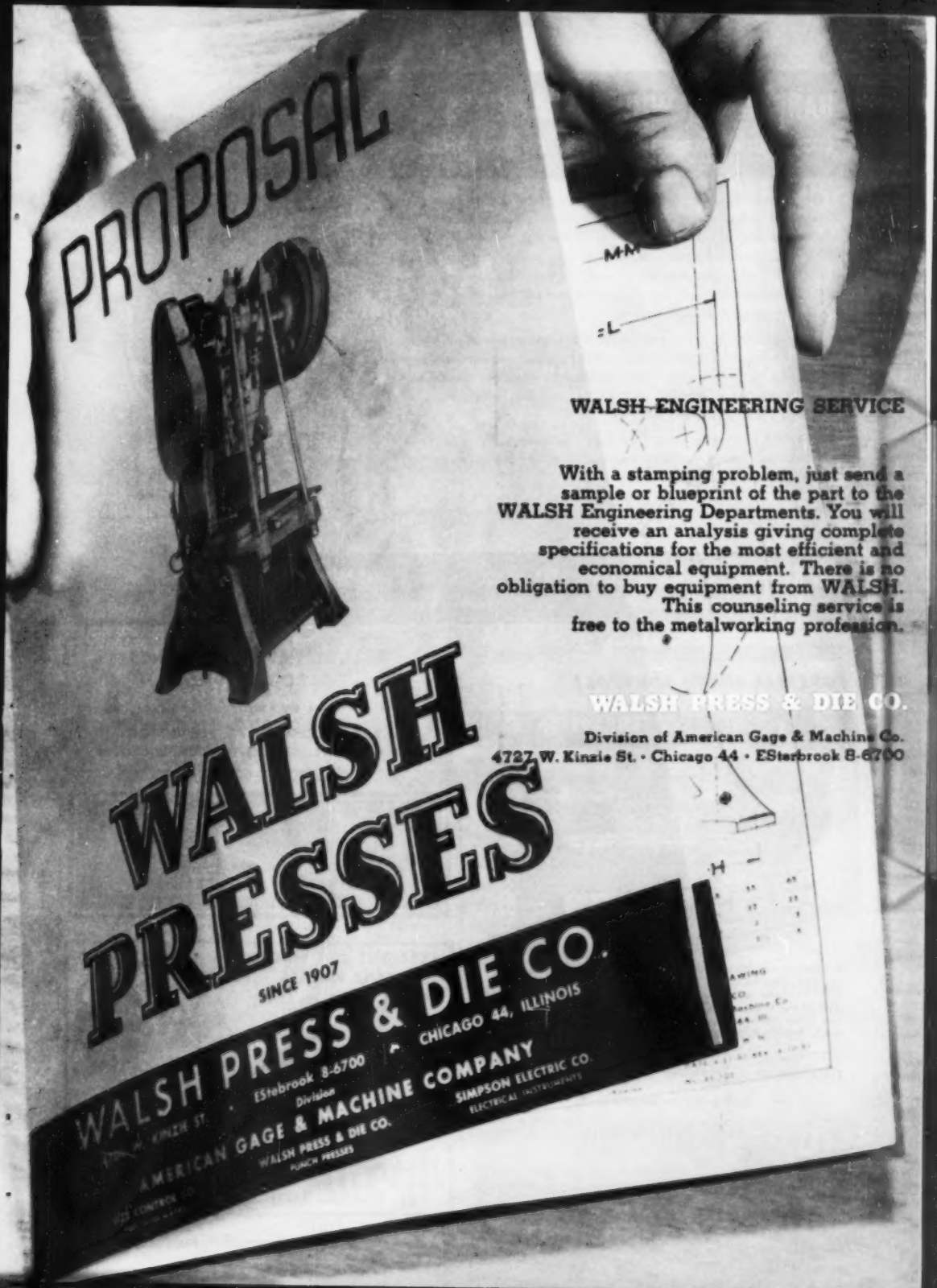

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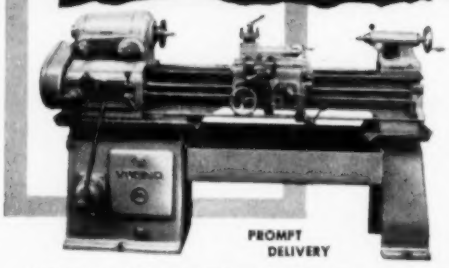

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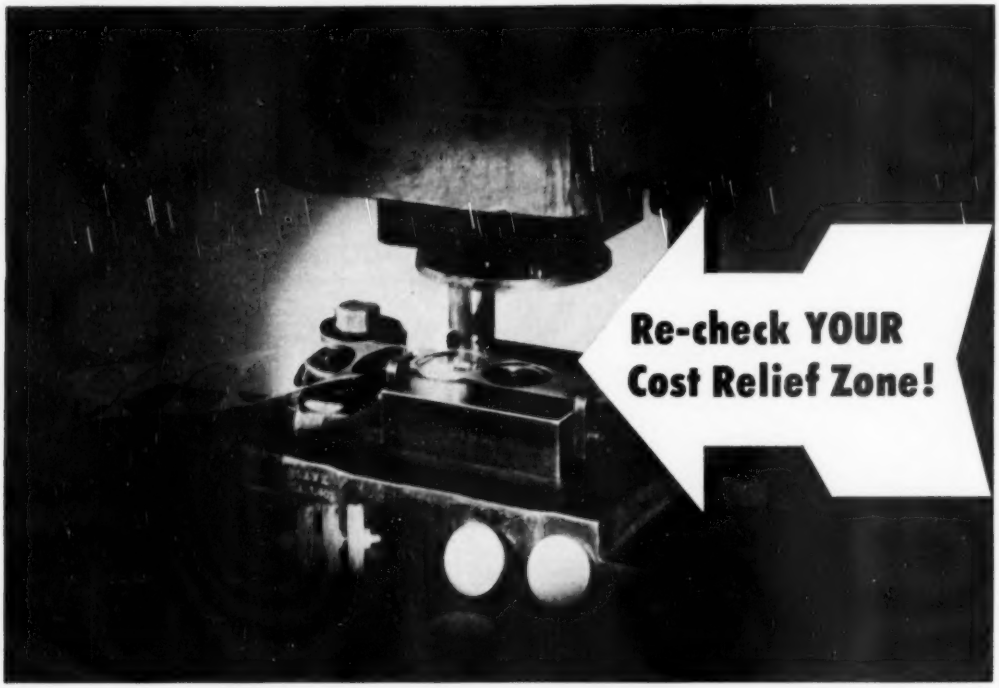


Here's a Challenging Opportunity for Every Man Responsible for Tooling and Production

Your *tools* and *dies* represent an immediate opportunity to bring unit costs down to a reasonable level. A quick re-check of this vital cost zone can result in definite savings. Sometimes these savings show up in less die finishing or adjusting. Or in longer runs with less downtime for regrinding. Many times they come about through a drastic reduction in the *number* of tools and dies you make each year.

Actual job records in plant after plant *prove* these cost economies can be realized. A good example is the job shown above. A re-check of these dies, used to blank and form .008" thick bronze thermostat diaphragms, showed that a different steel with better wearing qualities was needed to reduce excessive downtime for regrinding. This steel, Carpenter Hampden (Oil-Wear), eliminated *11* hours of machine downtime each week and produced over a half-million *extra* diaphragms per grind!

Certainly, if other plants are finding new output and production savings by re-checking their tools and dies, you can too. First step is to use The Carpenter Matched Set Method to select the one steel best suited for your job. By so doing, you back your selection with really dependable Carpenter Matched Tool and Die Steels. Then a call to your nearest Carpenter Mill-Branch Warehouse or Distributor brings fast delivery from stock. THE CARPENTER STEEL COMPANY, 109 W. BERN ST., READING, PA.

Are You Missing These Opportunities In Your Cost Relief Zone?

- Less die finishing and adjusting
- Greater output between grinds
- Fewer heat treating failures
- Less machine downtime

On Job After Job Carpenter Matched Tool and Die Steels Have Made Them Possible!

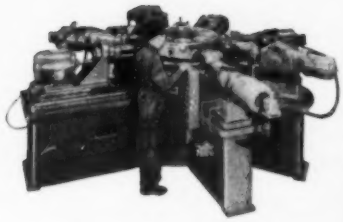
Carpenter STEEL

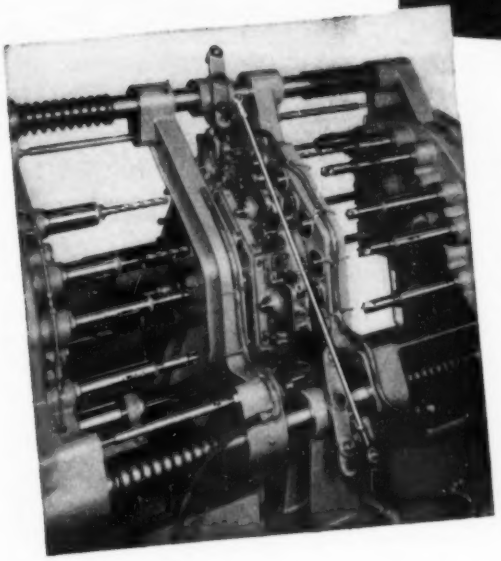
Matched Tool and Die Steels

Export Department: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"

Mill-Branch Warehouses and Distributors in Principal Cities Throughout the U. S. A. and Canada

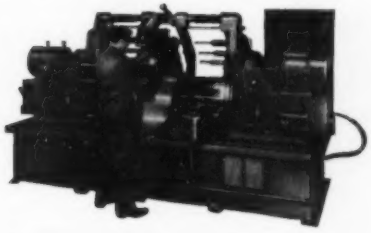
closeups of drilling & tapping PRODUCTION





The Hartford Special machine above is drilling, tapping and chamfering side pad holes in compressor rear frames.

The machine at the left, using a vertical dial, is core drilling, rough and finish reaming, rough and finish facing and chamfering two rockers simultaneously.



When it comes to production —

HARTFORD *Special*

SUPER-SPACERS

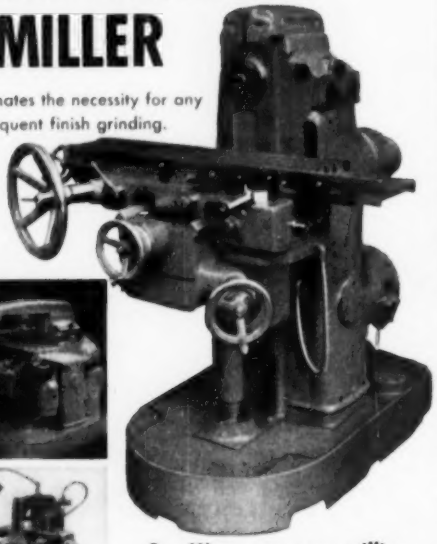
Automatic THREAD ROLLERS

THE HARTFORD SPECIAL MACHINERY CO., HARTFORD 12, CONN.

A NEW DEVELOPMENT

WERNER #5101 *SUPERFINISH* MILLER

Eliminates the necessity for any subsequent finish grinding.



For Micron accuracy milling of precision instrument and similar parts.

This miller was developed by one of Germany's foremost optical instrument manufacturers, in conjunction with Fritz Werner A.G., to meet rigid specifications for milling non-ferrous metals to surfaces of Micron accuracy.

Built with exacting craftsmanship at the Werner works, where over 50 years of experience in the building of precision knee type millers assures you of the best in design for trouble free operation, this, and other Werner millers are available on **PROMPT AND REASONABLE DELIVERY SCHEDULES.**

For further information contact:

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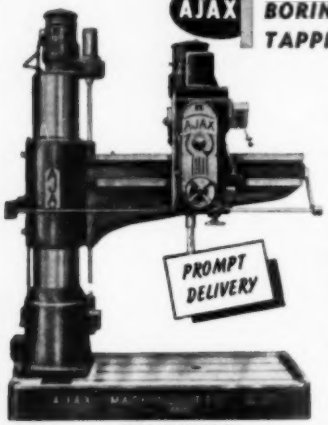
MACHINERY CORP.

1819 BROADWAY, NEW YORK 23 • CI 7-2048

Made in Halifax, England – Britain's Machine Tool Center!

AJAX ***RADIAL DRILLING BORING and TAPPING MACHINE***



. . . Featuring internal pillar with full length sleeve to eliminate end lift of arm. Extreme rigidity is assured with easy and positive locking arrangement! 3" diameter drilling capacity in cast iron.

The Ajax Radial Drill meets all the demands of the best high speed steel and carbide tipped tools. High quality materials and workmanship together with the utmost ease of handling the centralized controls guarantee a long and trouble-free life.

Write today for full specifications.

PARTIAL SPECIFICATIONS

Max. radius of spindle from ctr. of col.	5'0"
Saddle traverse along arm	3'2"
Baseplate	
Length of working surface	4'0"
Width of working surface	3'0"
Height of working surface	8"
#4 Morse taper	
Spindle speeds (8)	60 to 1114 rpm

Sales Territories Open

MOREY *for machine tools!*

MOREY MACHINERY CO., INC.

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CANAL 6-7400 • CABLE ADDRESS: WOODWORK, N. Y.

New ROGERS KNIFE GRINDER

Developed for ATOMIC PROGRAM

A new type hydraulic system enables the 184" table of this 12 ton knife grinder to traverse at a rate up to 150' per minute. Reversals are smooth and table attains speed within a foot of traverse after reversal. A magnetic chuck speeds work loading and unloading. Flat platen or table and 40 H.P. grinding motor can be provided for *high speed production grinding.*

Send for Bulletin 220.

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Vanadium-Alloys

TOOL STEELS for Special Purposes

Silman

The **SHANK STEEL**

throughout the Metal-Working Industry

OTHER IMPORTANT SILMAN APPLICATIONS

- Rivet Sets
- Punches
- Track Chisels
- Shear Blades
- Hand Chisels
- Coal Cutters
- Pneumatic Chisels

As the most widely-used shank steel for carbide tools, SILMAN has excellent wetting properties for brazing compounds, develops proper hardness automatically at brazing temperatures, and has the capacity to absorb heavy shocks without bending or breaking. SILMAN's high physical properties make this steel ideal for impact tools and others where hard use is a normal service factor. Write for technical information on SILMAN and other Tool Steels for Special Purposes produced by Vanadium-Alloys Steel Company.

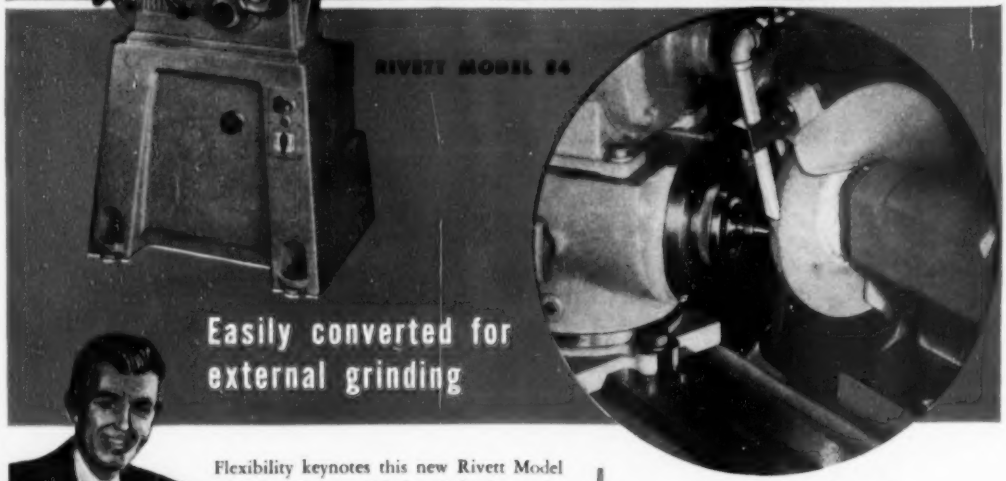
Vanadium-Alloys

STEEL COMPANY

LATROBE, PA.

COLONIAL STEEL DIVISION • ANCHOR DRAWN STEEL CO.

A new small hole grinder



Easily converted for external grinding

Flexibility keynotes this new Rivett Model 84. Primarily a small hole grinder, it may be equipped for external grinding. Simplicity reduces set-up time on the variety of work normal to the tool-room and die shop. Collets and step chucks quickly mount single or repetitive pieces.

The new Rivett 84 grinds holes from the smallest up to 3" diameter, with a maximum 4" depth depending upon diameter; external work to 3" diameter by 4" length.

If you need versatility with extreme accuracy, you will want to learn more about this new grinder. Send for Catalog 84.

FEATURES

- ★ Optional Wheelheads for internal and external spindles.
- ★ Internal Spindles 12,000 to 35,000 r.p.m.; sealed from grit and pre-lubricated for life.
- ★ Lathe-Type Workhead Spindle mounts draw-in collets and step chucks directly.
- ★ Micrometer Table Stop for positioning work when shoulder grinding.
- ★ Mechanical Power Table Travel with infinite adjustment of speed and stroke.
- ★ Hand Table Travel with coarse and fine feeds graduated to .001".
- ★ Hand Infeed with coarse adjustment to .001", and fine to .0001" reduction of work diameter.

RIVETT · LATHE & GRINDER, Inc.

Dept. AMR-11A, Brighton 35, Boston, Massachusetts

For More Precision Work RELY ON RIVETT LATHES AND GRINDERS, The Master Craftsman's Master Tools

Development...

. . . OF NEW PRESSURE PROCESSES CALLS FOR H-P-M's

Another industrial "dream" has come true at the Liberty Plant of the Mullins Manufacturing Corporation. Here artillery shells are being mass produced by a dramatic, new COLD-EXTRUSION process which Mullins has perfected and labeled "KOLDFLO".

Cold-extrusion has long been a dream of the entire metalworking industry. This brand new method of moving and shaping metal cold produces finished parts with glass-smooth surfaces and close tolerances, with physical characteristics which otherwise would require alloy steels and heat treatment to achieve.

Cold-extrusion offers unlimited opportunities to the entire metalworking industry for it is a proven process whereby any number of things can be made from metal faster, cheaper and better. It is another new pressure processing application in which H-P-M presses have played an important part.

When seeking the solution to a tough machine or production problem, it will pay you well to look into versatile H-P-M All-Hydraulic Fast-raverse Presses . . . built for every pressure processing application. Invite us in at the planning stage, won't you?

HPM 75 YEARS

For further information on cold-extrusion and other ordnance presses and processes ask for H-P-M Bulletin 5208, on your company letterhead, please.

THE HYDRAULIC PRESS MFG. COMPANY

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Builders of Presses for the Metal Working & Processing Industries • Plastics Molding Presses • Die Casting Machines • Hydraulic Pumps, Valves & Power Units

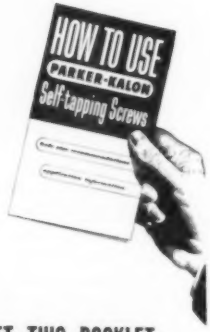
It pays to "Meet the Family" of the First Self-tapping Screw

The *original* Self-tapping Screw was the Parker-Kalon Type A. Today P-K makes several standard types, and hundreds of modifications can be made to special order. Here's why it will pay you to "meet the family".

From this wide selection you can choose the screws best suited to your fastening job, often several types in the same assembly. There is no need to fit the job to any single type of screw.

That's why the advice of a P-K Assembly Engineer is unbiased. You can get the help of this fastening specialist on request. With the experience of more than a million applications to draw on, he can quickly determine the best way to replace slow, complicated assembly techniques with the fast, easy, efficient P-K method.

Question *every* fastening. A P-K Assembly Engineer will help you start making the savings you've been missing.



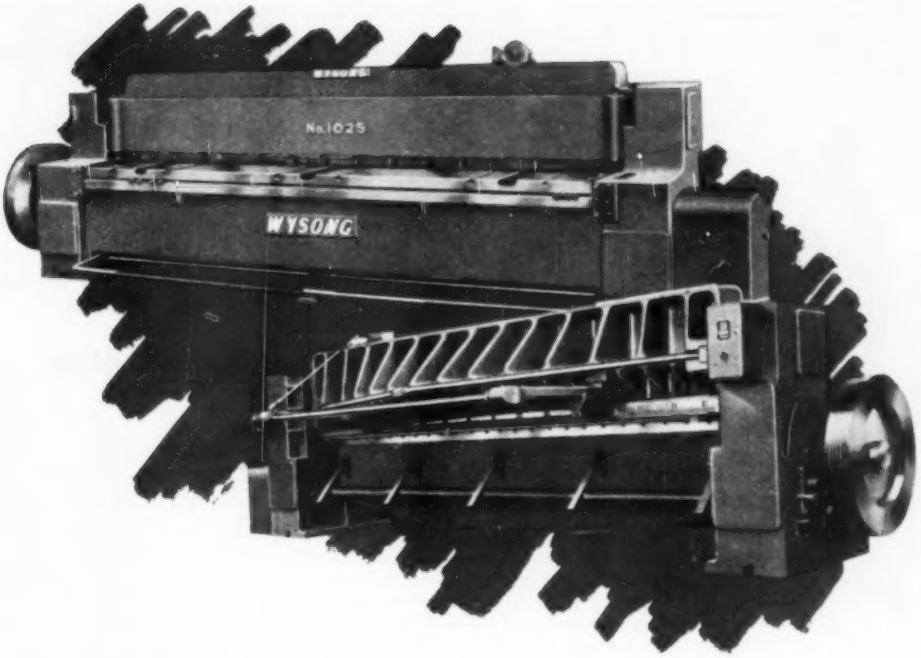
PARKER-KALON®

The Original **SELF-TAPPING SCREWS**

AND OTHER FASTENING DEVICES

GET THIS BOOKLET

Tells "where to use what" types of screw in all types of metals and plastics, gives hole-size recommendations and other information. Ask your P-K Distributor for Form 480. Or, write Parker-Kalon Corporation, 200 Varick Street, New York 14.



WYSONG 1/4 INCH PLATE SHEARS

No matter how you look at it you can see the massive, rigid construction of the WYSONG ¼-inch series . . . made in 4, 6, 8, and 10 feet cutting lengths. Bed, end frames, and knife bar are one-piece Hi-tensile castings. Bearing surfaces between end frames and table, and gibbed ways for hold-down and knife bar travel are hand scraped for perfect fit and true squaring.

A clearly visible cutting line makes it easy to cut to a scribed line. Slotted metal finger guard, mounted on hold-down, protects fingers without obstructing view.

An automatic, mechanically operated *hold-down* provides powerful, positive hold down action. The simplicity of the roller and cam action makes it sure and trouble free. Individual compression springs in each foot compensate for varying thicknesses in metal being sheared . . . Front operated, ball-bearing *back gauge*, adjustable to .0078 (1/128th) of an inch, is standard equipment. A *power operated back gauge*, in ranges of 24 and 36 inches can be furnished at extra cost . . . Powerful WYSONG *jaw-type clutch* has built-in non-repeat unit.

For performance . . . feature for feature and dollar for dollar, you can't beat the value of WYSONG squaring shears. Compare the WYSONG line with others in the field . . . and for shear satisfaction, buy WYSONG.

WYSONG builds Squaring Shears in cutting lengths from 3 feet through 12 feet, in motorized, air-power and foot-power models; O. B. I. Presses; Slip Roll Formers; and Rotary Combination Machines. See your dealer or write factory for full information.

Wysong and Miles Company, Greensboro, North Carolina

Illustrated above: Wysong No. 1025, Cap. 10 ft., ¼in., mild steel

WYSONG

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At Circle R, excellence in quality of product has been the standard since 1923. When the corporation was formed in that year, all the members had already been experienced saw makers for long periods. Their determination was that the company's product should be not merely better, but the best.

Our circular metal cutting tools have a reputation for excellence which is still unsurpassed. You'll find them the most efficient and economical you can buy.

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♦ BLACK DIAMOND • PRECISION DRILL GRINDER FOR ALL SMALL DRILLS

This motor-driven machine cuts grinding and drilling costs 50%, and more, saves expensive drill stock, reduces work spoilage and drill breakage.

SAVES—50% & more on Grinding Small Drills. SAVES on Drilling Time. SAVES by Reducing Work Spoilage. SAVES in Every Use of Small Drills.

Sharp, small gauge or fractional drills in quantities cost real money to put an experienced mechanic to work on them.

With a Black Diamond, however, anyone can keep all small drills sharp—with lips ground to exactly the same length, proper angle and with correct clearance for fast, precision drilling.

The built-in Diamond Point Dresser keeps the grinding wheel ever sharp cutting and the Web Thinning Attachment cures for all types of Notched points to perfection.

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FIVE WAYS TO FORM GEARS

1. Powder Metallurgy
2. Casting
3. Extrusion
4. Cold Drawing
5. Plastic Molding

These five processes are some of the methods used to produce precision gears. Each of these methods solves one or more production problems: cost . . . unmachinable material . . . complex shape.

"Five Ways to Form Gears," a 16-page *American Machinist* Special Report, explains each method . . . including latest examples, applications, relative costs, tolerances, and hints on machining.

Equally useful Special Reports on the following related subjects are also available:

A MANUAL OF GEAR-MAKING EQUIPMENT
12 pages — 20 cents a copy

MODERN GEAR-CUTTING EQUIPMENT
12 pages — 20 cents a copy

HOW TO HEAT-TREAT SPUR GEARS
12 pages — 20 cents a copy

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American Machinist

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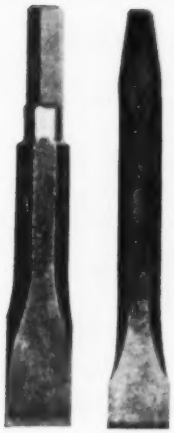
New York 36, N. Y.

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Bethlehem Supplies Export Corporation

Which chisel has the better design?



Both these chisels, used in pneumatic chipping hammers, are made from shock-resisting tool steel (Bethlehem Omega). One of them consistently gives long service life, while the other is subject to breakage — due directly to its design.

Can you pick out the better design? Look at them carefully. It's the one on the right with the tapered shank.

You still see a lot of chisels designed like the one at the left, that's so susceptible to breakage. Even with the fillet between the round and octagon sections, this chisel is subject to fatigue-failures at the change of section. Stresses become concentrated there, causing premature fractures.

Shank failures are virtually unknown in chisels of the improved, tapered-shank design. The gradual taper prevents any dangerous concentration of stresses.

The comparison of these two chisels helps to explain why it takes more than just good tool steel to get the best performance out of tools and dies. It takes good tool design . . . correct heat-treatment . . . the right grinding technique . . . and proper application. But of course it takes the right grade of good tool steel, too!

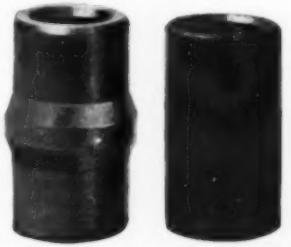
Omega halts coupling breakage

Omega tool steel plays a vital role in the drilling of blast holes at the Scrub Oaks and Oxford Mines in the historic iron ore belt of Northern New Jersey. In drilling holes from 35 to 125 ft deep, rods of 1-in. hollow drill steel are joined by patented couplings developed by Ralph Catanzarita, drill-steel-shop foreman at Scrub Oaks mine.

When this method of drilling long holes was first tried, the frequent breakage of couplings was discouraging. Our salesman learned of the trouble and sold them on Omega. This shock-resisting grade did the trick. Coupling failures were reduced to about 1 in 500; and there hasn't been one case of stripped threads.

Omega is outstanding for chisels, and it does a swell job on other cold-shock tools: knockout pins, pawls, punches, swaging dies, clutch pins, shear blades, drive shafts, and machine parts subject to slam-bang shocks. Omega is a tool steel engineered to take the heaviest shocks in its stride. Its typical analysis:

C	Mn	Si	Mo	Va
.60	.70	1.85	.50	.25



It takes a really tough tool steel to take the shock and stress involved in coupling together rods of rock-drill steel. The coupling at left is unused. The one at the right has been used in drilling 1700 ft of blast hole in hard iron ore. The outside wearing surfaces have been worn down by the abrasive rock.

TOOLMAKER AT WORK—As this progressive die nears completion, the toolmaker checks dimensions carefully. The die is used to blank, punch and form lawnmower parts from 3/16-in. steel strip. It is made from Lehigh H, a high-carbon, high-chromium grade, and hardened to Rockwell C 60. When placed in service the die turned out about 30,000 pieces between grinds, operating in a 200-ton press.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

Air-hardening steels should be quenched uniformly

What are the advantages of uniform quenching? First, a minimum of dimensional change or distortion; and second, a minimum of undesirable residual quenching stresses.

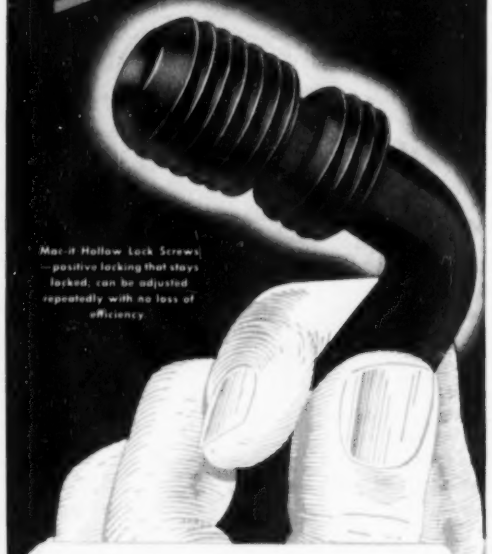
Here are some helpful points to remember when quenching air-hardening steels:

- Place the tool on a coarse-mesh screen to permit circulation of air on all sides of the tool.
- Turn over the tool at intervals to improve cooling-uniformity.
- Use a fan or a blast of dry air over the sections which cool most slowly. (Caution: *Too much* air will cause additional non-uniformity.)
- Sections of the tool which cool too rapidly can be wrapped in wire mesh to retard cooling.
- If one portion of the tool turns black long before other portions, you can be sure that it's not cooling uniformly.

IT'S A

Mac-it

PRONOUNCED "MACK-IT"



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For the toughest kind of fastening jobs, the complete Mac-it line of heat-treated, alloy steel screws will give you the strength you need *where you need it!*

Mac-it's 38 years' experience in the manufacture of these top-quality fasteners is your assurance of precision, uniformity and strength. Sold through leading industrial distributors from coast to coast and in Canada.

Other Mac-it products include:

Socket Head Cap Screws	Socket Screw Keys
Hollow Set Screws	Square Head Set Screws
Stripper Bolts	Hexagon Head Cap Screws
Hollow Pipe Plugs	. . . and many others

Marketed Nationally Since 1913 by

STRONG, CARLISLE & HAMMOND COMPANY

Cleveland 13, Ohio

Manufactured by MAC-IT PARTS COMPANY, Lancaster, Pa.

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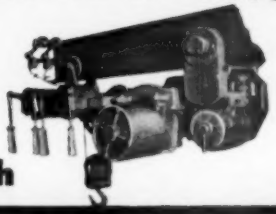

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Just one man can lift and move those heavy loads around your plant, with ElectroLift.

Safe, compact, smooth, quiet, fast . . . with a choice of many models for any use. Capacities up to 6 tons. Optional pushbutton control gives pin-point accuracy.

For further features, consult your Electro-Lift representative in telephone directory.

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MORE PRODUCTION . . .
Less Effort!

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DEUTSCHE NILES
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For dependability, safety and extremely simple operation, the DEUTSCHE NILES offers many advantages. Speeds and feeds are easily controlled. All levers, manual and rapid traverse settings are controlled from the operator's position. Idle time is reduced to a minimum. High speed steels and carbide tools can be used. It is possible to use the full power of the machine without overloading.

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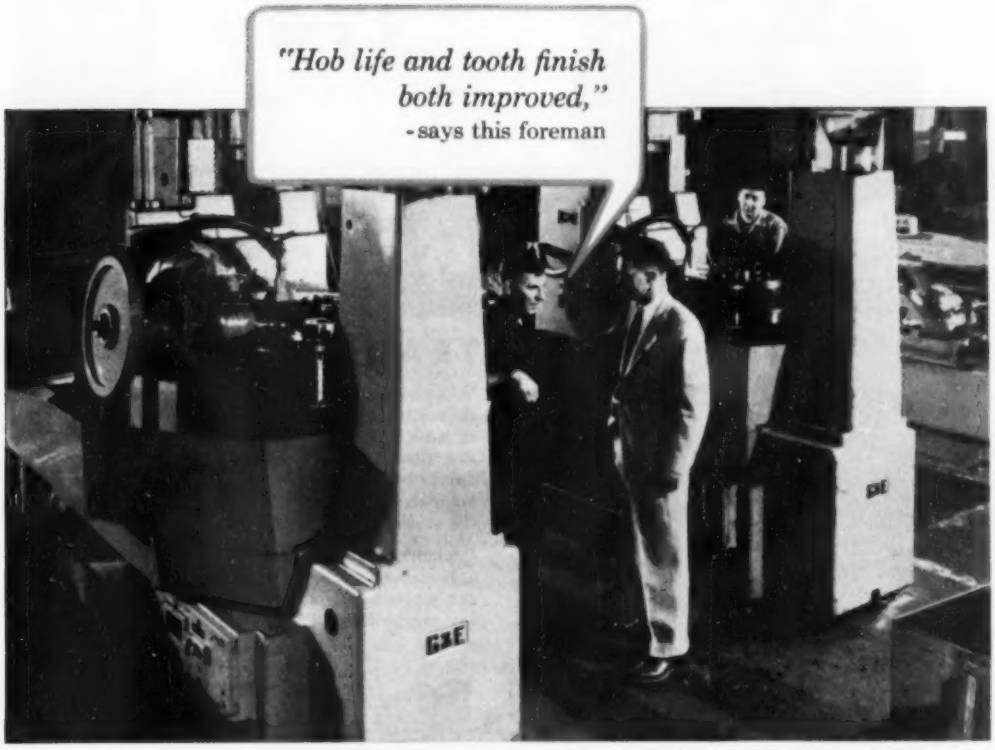
TELEPHONE: RUTHERFORD 2-7890

alloy steel drive gears for M-47 tank

hob better with GULF ELECTRO CUTTING OIL!



Operation—cutting involute teeth on alloy steel spur gears, Gould and Eberhardt Gear Hobbers; results with Gulf Electro Cutting Oil—Hob life increased 20%, scuff marks eliminated on gear teeth, and hob grinding costs reduced.

Here's the important reason why Gulf Electro Cutting Oil produces outstanding results like these: Thanks to a special Gulf process of combining sulphur, it provides greater sulphur activity over the entire range of a cutting operation. This means longer tool life and better finishes.

Call in a Gulf Sales Engineer today and arrange to use this quality cutting oil on your tough machining operations, or send the coupon below for additional information.

GULF SERVES INDUSTRY

Gulf Oil Corporation · Gulf Refining Company AM
719 Gulf Building, Pittsburgh 30, Pa.

Please send me, without obligation, a copy of your pamphlet "Gulf Electro Cutting Oil."

Name .....

Company .....

Title .....

Address .....

Performs 180 operations in 43.5 seconds. Drills, spot-drills, rough-bores, c'bores, c'sinks, and reams. Includes 360° rotating fixture for removal of chips at station No. 11, and automatic gauge of drilled holes at station No. 17.

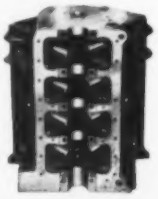
Capacity...

80!

CYLINDER BLOCKS AN HOUR

379!

OPERATIONS

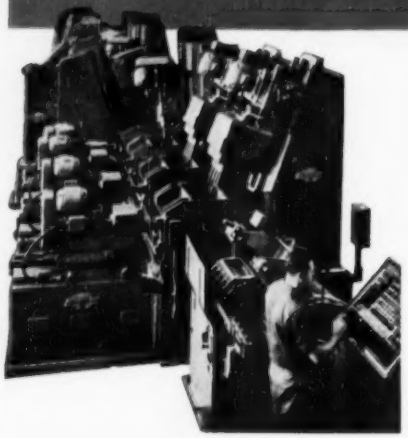


GREENLEE

TRANSFER MACHINES

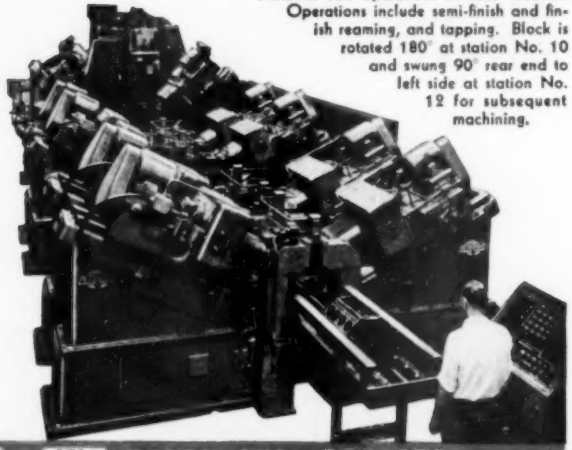
When you see one of these big Greenlee transfer machines working — turning out a tremendous quantity of work so smoothly and easily — you realize the qualities that make them great. Here is power, precision, durability, and a vast multiplicity of operations in a compact, integrated unit. Here is modern mass-production in its most successful form.

Greenlee's pioneering experience, added to years of accumulated skill, has created an organization that can successfully and repeatedly produce these outstanding machines.



Performs 76 operations in 43.8 seconds. Drills, c'sinks, c'bores, and trepans. Tilts part at station No. 1 to 180° for subsequent machining. Automatically gauges and cleans drilled holes at station No. 20.

Performs 123 operations in 35.5 seconds. Operations include semi-finish and finish reaming, and tapping. Block is rotated 180° at station No. 10 and swung 90° rear end to left side at station No. 12 for subsequent machining.



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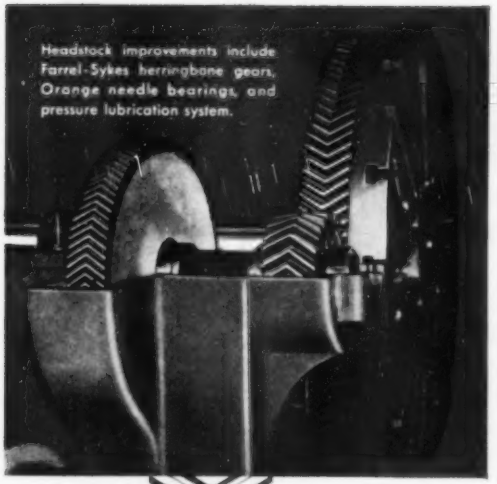
Headstock improvements include Farrel-Sykes herringbone gears, Orange needle bearings, and pressure lubrication system.

Huge, Rebuilt Lathe operates *Smoother Faster* with Farrel® Gears

In rebuilding a giant, 100" lathe, Simmons Machine Tool Corporation, of Albany, N. Y., used Farrel-Sykes herringbone gears to replace spur gears on the two final gear reductions.

With these new gears, new shaft bearings and a pressure lubrication system, Simmons was able to *double* the normal spindle speeds of the machine. Furthermore, on test, they found the rebuilt lathe to be "exceptionally smooth and quiet in operation for a machine of this size."

The quiet, vibration-free performance you can expect from Farrel-Sykes herringbone gears results from extreme accuracy of tooth spacing, contour and helix angle, and other qualities inherent in the Farrel-Sykes method of gear generation. They are made of the finest grade materials, in a complete range of sizes, for any power capacity and any application.

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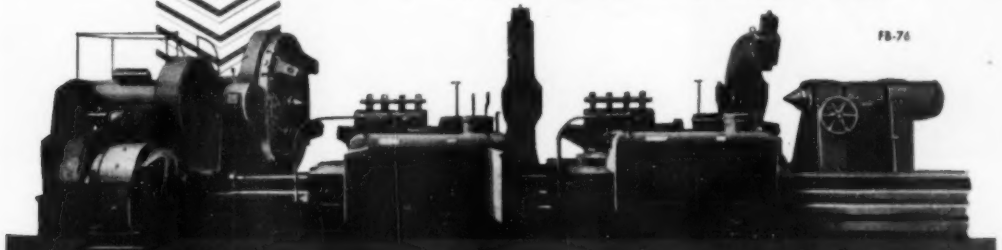
FB-76



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for
LATHES
TURRETS
MILLS

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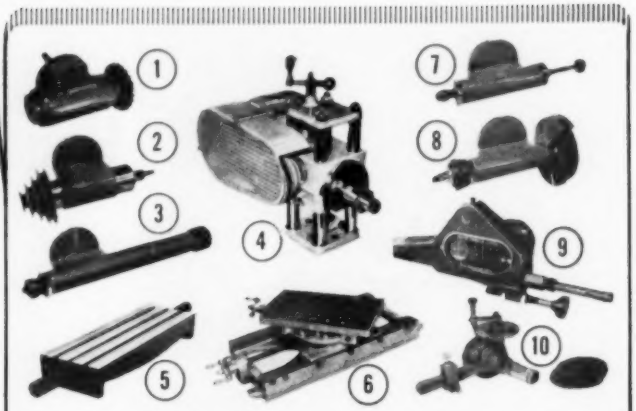

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6. Universal Feed Table
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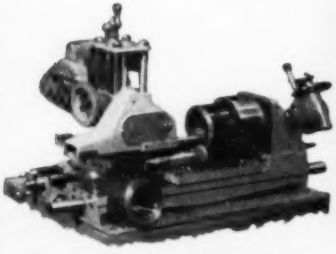
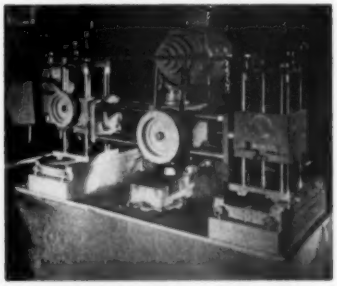


Master portable key seating and slotting head cutting internal splines on bench set-up



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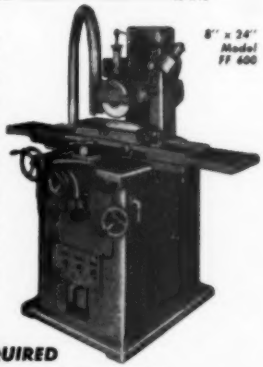

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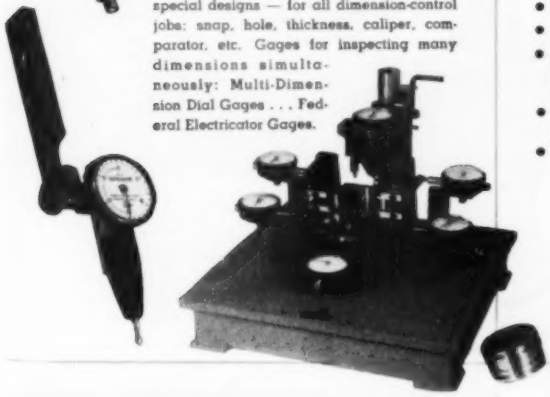

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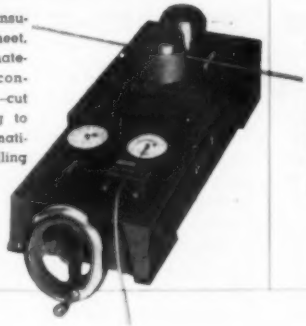

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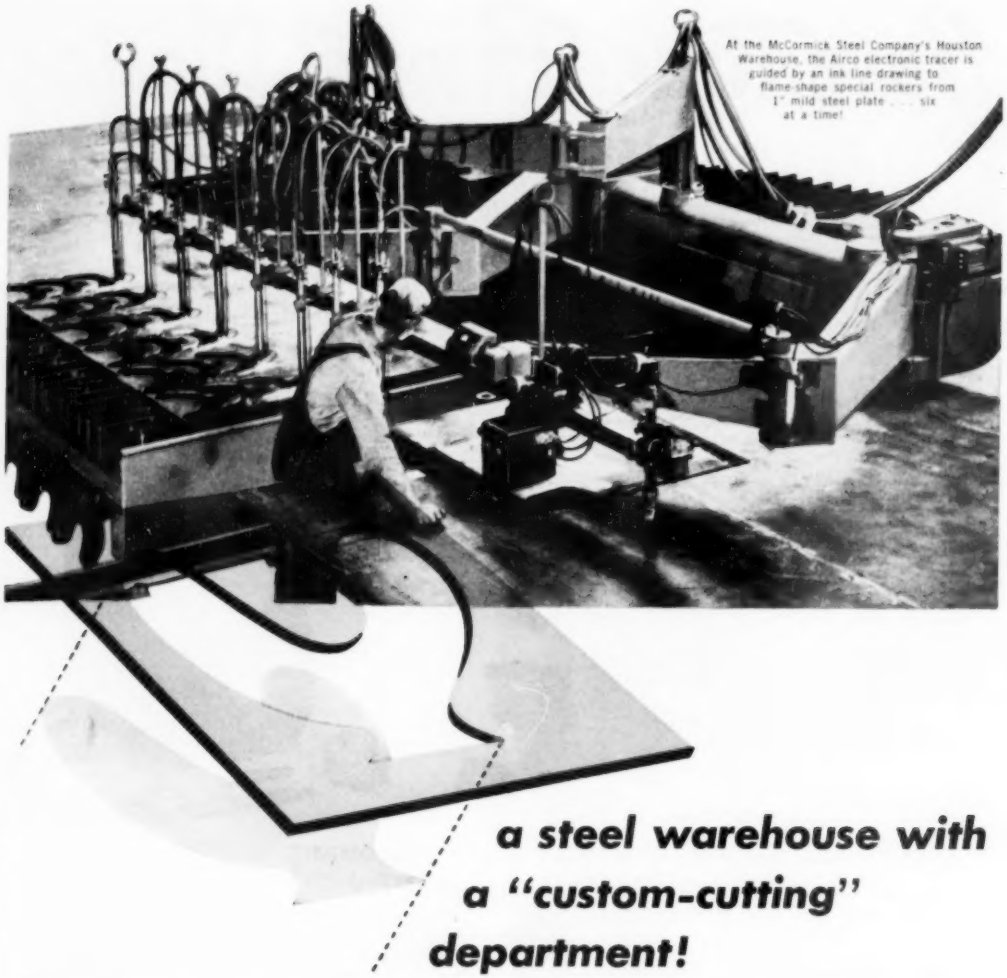

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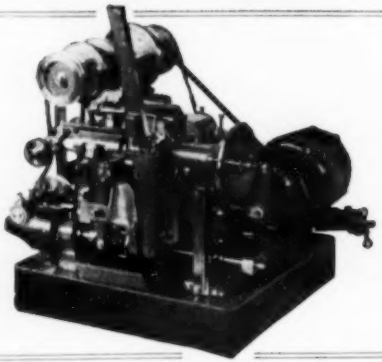

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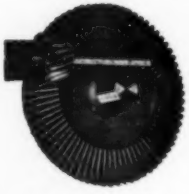

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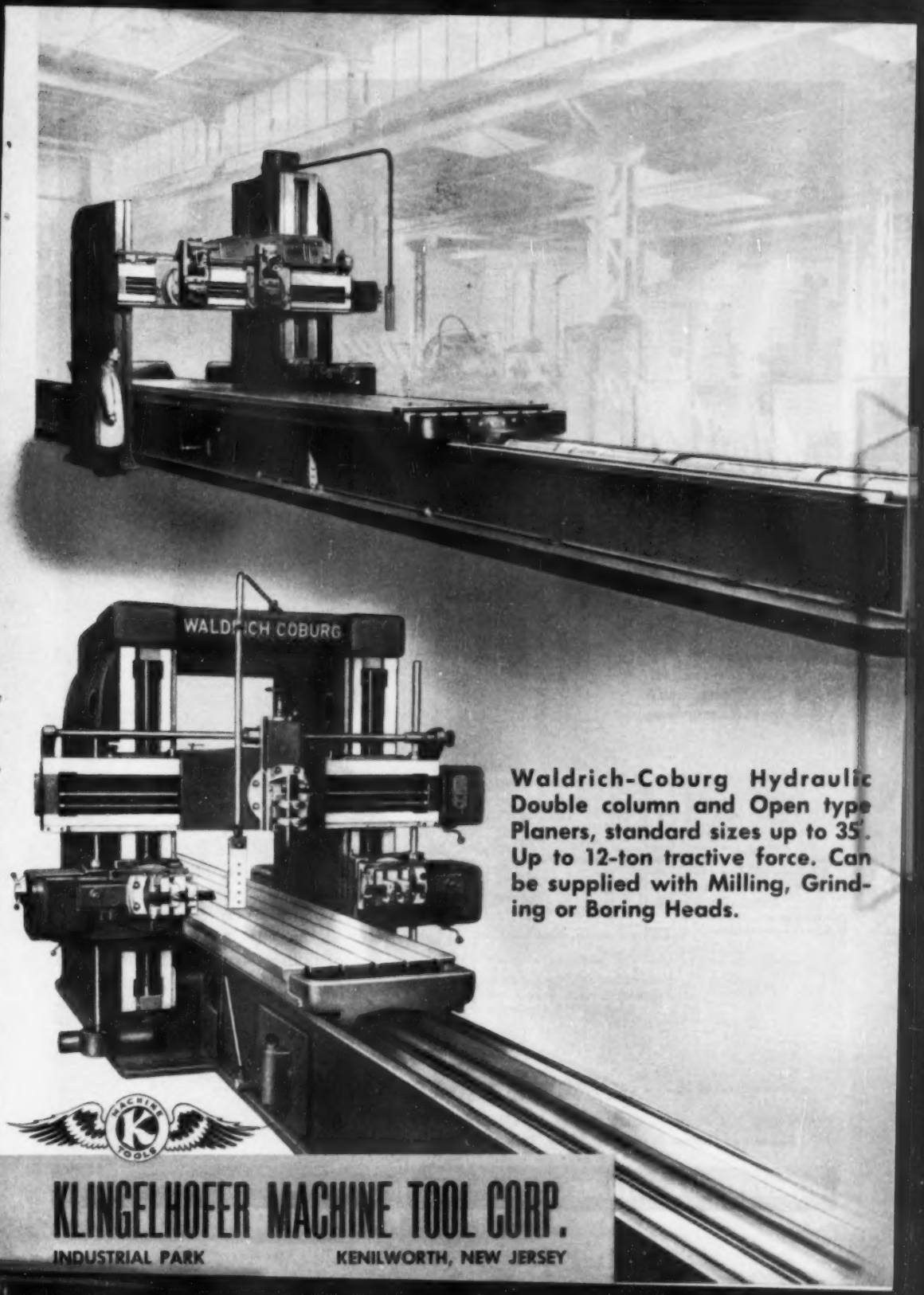

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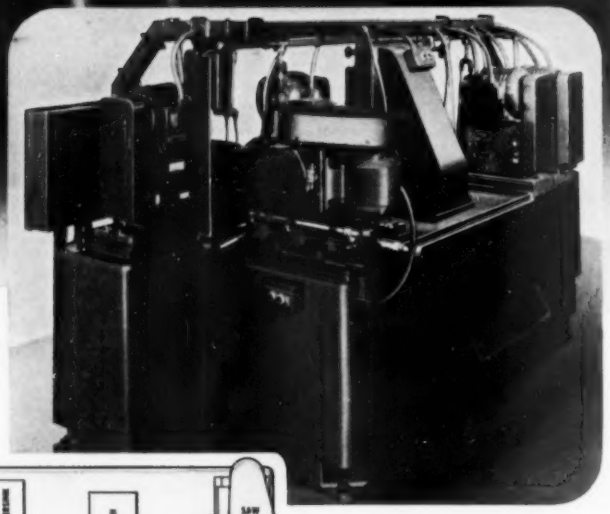

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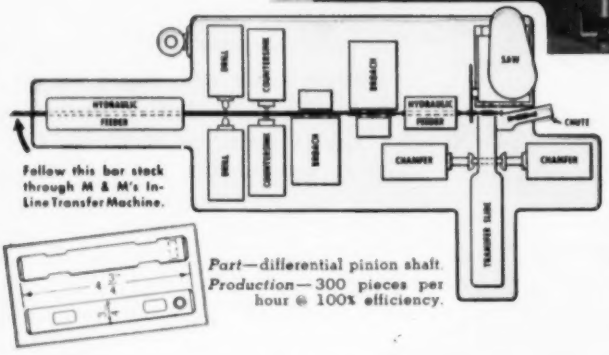

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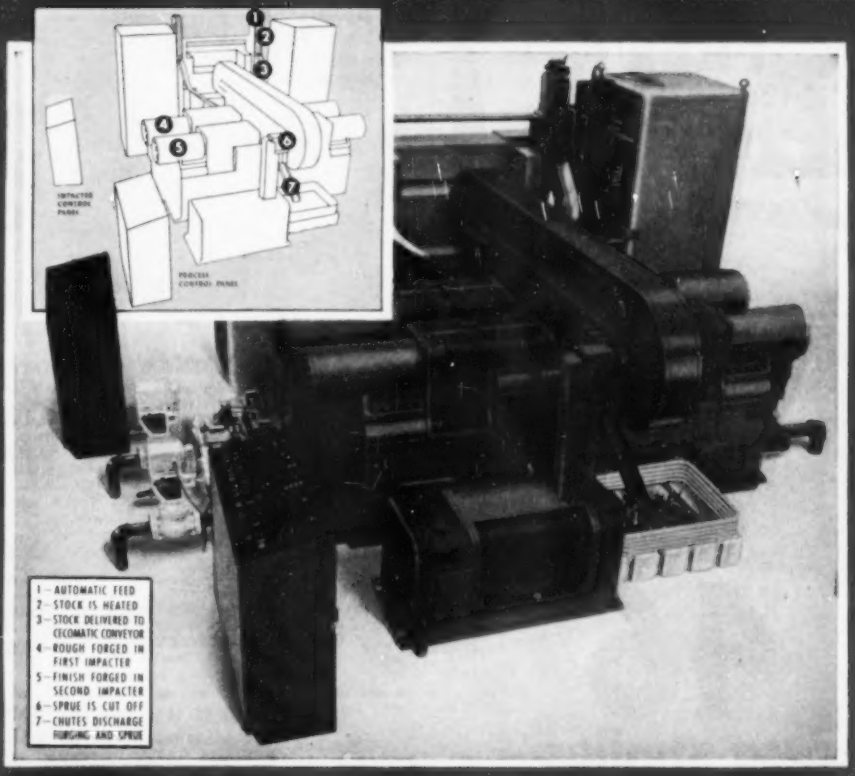
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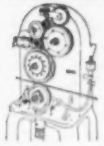

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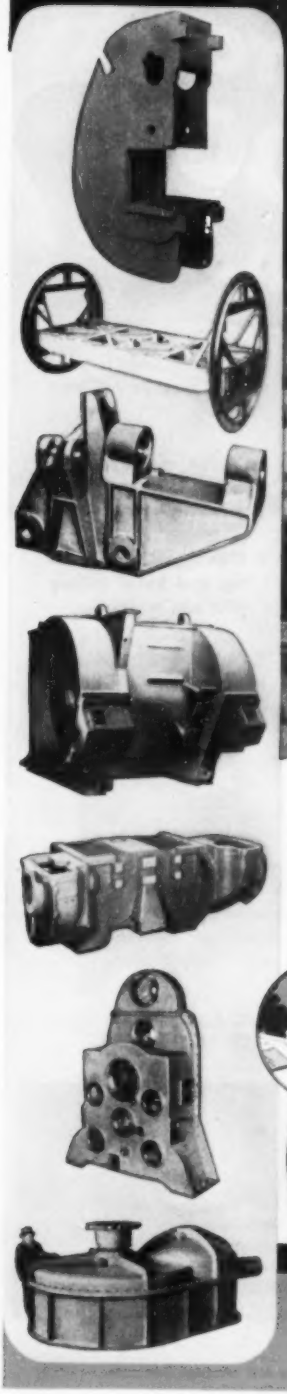


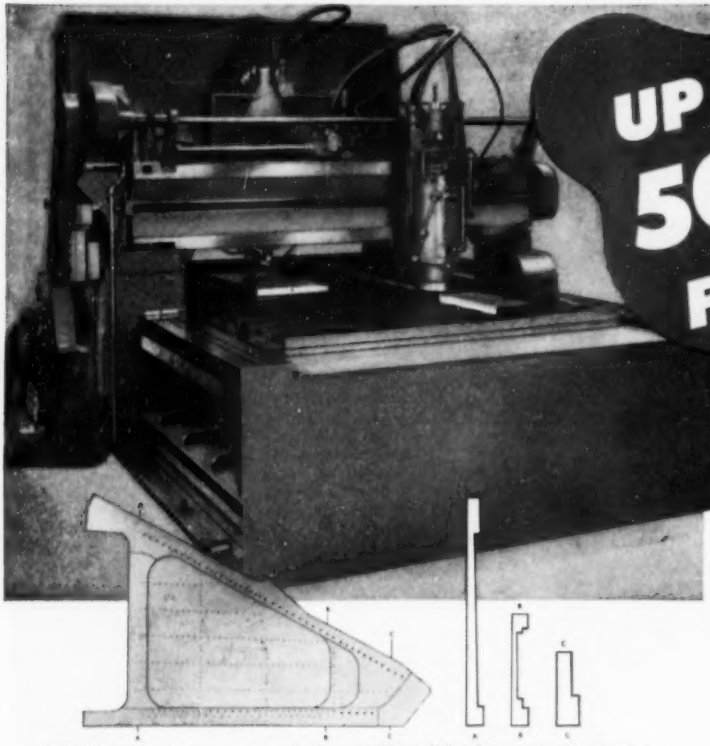
Use WELDED STEEL for Greater Strength with Less Weight!

Above you see the Crown and Bed of an 800 Ton Press produced by Steel-Weld Fabrication in the Mahon plant for one of the largest manufacturers of heavy presses. These massive pieces, and the parts and assemblies illustrated at the left, are typical of thousands of units Steel-Weld Fabricated and machined by the Mahon Company for manufacturers throughout the country. If there are parts or assemblies in your product that could be redesigned and produced in welded steel to better advantage from a strength-weight standpoint, or, if you are faced with a limited production on an item involving heavy pieces in which pattern costs are a consideration, you can turn to Mahon with confidence. You will find in the Mahon organization a unique source with complete, modern fabricating, machining and handling equipment to meet your requirements . . . a source where skillful designing and advanced fabricating technique are supplemented by craftsmanship which assures you a smoother, finer appearing job, embodying every advantage of Steel-Weld Fabrication. See Mahon's Insert in Sweet's Product Design File, or have a Mahon Sales Engineer call on you at your convenience.

THE R. C. MAHON COMPANY
DETROIT 34, MICHIGAN

Engineers and Fabricators of Steel in Any Form for Any Purpose

MAHON



UP TO 500% FASTER

- Feeds up to 12′ per minute.
- Profile milling head mills 90° angle corner without slow down.
- High speed profile milling and bevel milling with one machine.
- For aluminum plate and related metals up to 2″ thick.

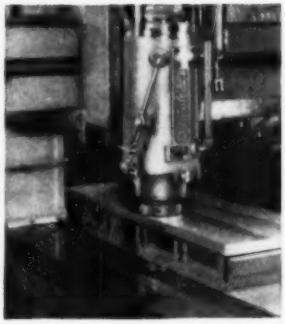
Typical Production Part . . . structural plate ¾″ thick, tapered from end to end. Face of part shown is relieved to four different planes. All work except drilling is performed on the A-72 Invo-Mill. A-B-C cross-sections are not to scale . . . thickness is exaggerated for step comparison.

For the profile milling or beveling of aluminum plate, the Onsrud A-72 Invo-Mill gives unequalled production speed and accuracy. In aircraft manufacturing, parts such as integrally stiffened wing panels, rib sections, and contoured frame members are now produced in one-quarter to one-fifth the time required before. Unusual design of the profile milling head assembly gives power feed in any direction in a horizontal plane . . . under direct profile bar or pattern control. Corners may be turned, or contours followed without slow down of feed. Beveling head mills any angle required in work . . . to a surface precision measured in micro-inches. For aluminum sheet or plate stock up to 2″ thick.

For complete information write for Bulletin 1140

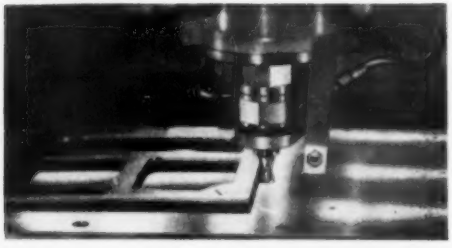
ONSRUD MACHINE WORKS, INC.

3921 PALMER STREET
CHICAGO 47, ILLINOIS



BEVEL MILLING HEAD

For face milling sheets or plate stock in a horizontal or angular plane.



PROFILE MILLING HEAD

Power feed head travel in ANY direction over table. Range is infinite under profile pattern control.

12 months "Snorkel" duty... and still in excellent condition

↑ Relubrication fittings for Fafnir Pillow Blocks are indicated by arrows. Once-a-week lubrication plus Fafnir Mechani-Seals protect submerged bearings.

↓ Complete installation shows relubrication fitting, pipe and Fafnir Pillow Block.

Standard Fafnir Ball Bearing Pillow Blocks

On a conveyor used for lifting steel balls from the water quench bath of a rotary type furnace are two 1½" Fafnir LAK Type Ball Bearing Pillow Blocks. These bearing units, running at 2-3 r.p.m., are three feet under water. The water bath has a pH of about 6 and a temperature automatically controlled at 90°F.

After 12 months of operation at 16 hours a day, 6 days a week, the pillow blocks were removed for inspection. Their condition is shown in the unretouched photograph below. According to a maintenance report, both the pillow blocks and bearings were in excellent condition and suitable for further service.

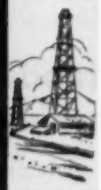
This application may help you to find a better, cheaper way to use bearings. Although it's unusual . . . it serves to demonstrate the multiple-uses of Standard Fafnir Ball Bearing Units plus their ability to operate efficiently under extreme conditions. Whatever your bearing problem, a few minutes spent with a Fafnir representative may help you solve it as successfully. The Fafnir Bearing Company, New Britain, Conn.

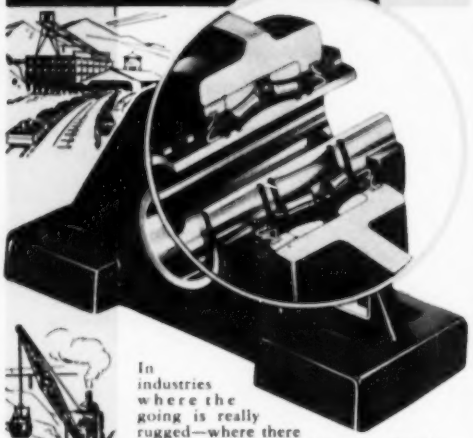
FAFNIR
BALL BEARINGS

MOST COMPLETE LINE IN AMERICA

Unretouched photograph of Fafnir Pillow Blocks, one disassembled, shows condition after 12 months operation 3 feet under water.

FOR *Rougher* SERVICE
SPECIFY *Tougher* SHAFERS





In industries where the going is really rugged—where there can be no uncertainty about bearing dependability, Shafer ConCaVex Bearings get the call. In fact, Shafer Bearings have faithfully served practically every heavy industry for over 3 decades. Add up these advantages and you'll see why:

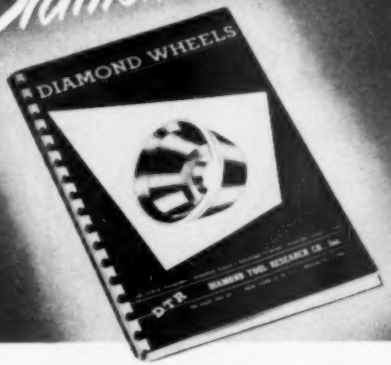
Self-Aligning • Free Rolling Action • Full Radial-Thrust Load Capacity • High Reserve Shock Capacity • Self-Centering "Z" Housing Seal • Micro-Lock 12-Point Adjustment • Sizes and Mountings for All Applications.

Feature for feature—dollar for dollar you get more when you specify Shafers.

SHAFER
SELF-ALIGNING
ROLLER BEARINGS
INDUSTRIAL • AIRCRAFT

SHAFER BEARING CORPORATION
801 BURLINGTON AVE.
Downers Grove, Ill.

NEW CATALOG OF
Diamond Wheels



DTR resinoid bonded diamond wheels are making headlines for quality, delivery and price. Our completely new 32 page catalog tells the whole story. Write for your copy today!

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305 East 45th Street • New York 17, N. Y.
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For: FLAT BARS
RODS · ANGLES
WIRE ROPE
CHANNELS
"The best from any angle."

Design
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Hand Operated
Send for Circulars

T. H. LEWTHWAITE MACHINE CO., INC.
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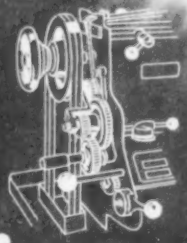
KING PORTABLE BRINELL HARDNESS TESTERS FOR ALL BRINELL TESTING

Puts an actual load of 3000kg on a 10mm ball.
Throat, 4" deep.
Gap, 10" high.
Weight, 27 lbs.
Test head removable for testing large parts—castings, forgings, etc.
Equally accurate as portable or stationary equipment.
Can be used in any position—even upside down.

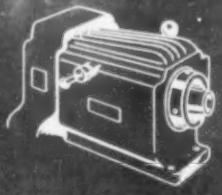
ANDREW KING
Box 606 J Ardmore, Pa.

The Last Word in... Precision Performance!

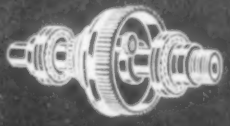
CLAUSING 6300
12" HEAVY DUTY PRECISION LATHE



OUTBOARD DRIVE



1" COLLET CAPACITY 1⅜" BORE
ASA-L-00 TAPERED KEY DRIVE SPINDLE



TIMKEN BEARING EQUIPPED

If your operations call for a precision 12" lathe of heavy-duty caliber, check your requirements against the capacities of the Clausing 6300. This outstanding lathe incorporates many features that bring new machining speed and efficiency. Forged steel spindle with tapered, key-lock nose—Timken tapered roller bearings—heavy-duty precision V-bed—quick change gears—splash lubrication of headstock, apron, and quick change gears—these are only a *few* of the reasons why the Clausing is such a great lathe value. Check all its features—at your Clausing distributor's, or send for catalog. Delivery is prompt on priority-rated orders.

CLAUSING DIVISION
ATLAS PRESS CO.
11101 N. PITCHER STREET
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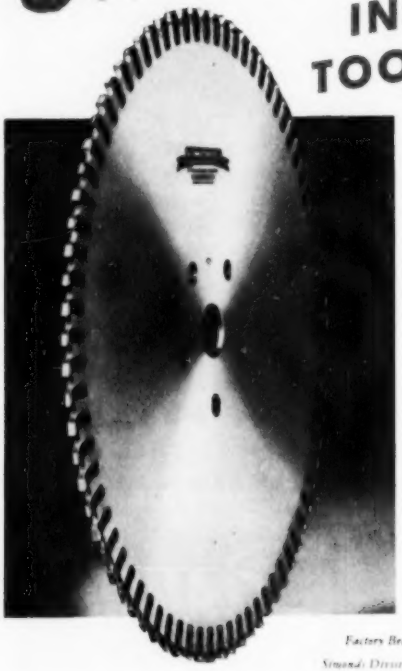
PRECISION MACHINE TOOLS
DIVISION ATLAS PRESS COMPANY
KALAMAZOO, MICHIGAN, U. S. A.

A Wedge for every tooth means Added Strength for SIMONDS

INSERTED-TOOTH SAWS



Here's the most rugged design of all metal-cutting saws . . . the tough saw-plate of special Simonds Steel, fitted with alternating square and beveled inserted teeth . . . *and with a wedge for every tooth*, to give that extra strength for heavy cutting. In fact, this saw is practically indestructible, for it can be readily repaired if damaged and restored to original efficiency by an average mechanic.

Yet Simonds Inserted-Tooth Saws have the same quick clearance as other Simonds Saws . . . and the inserted teeth cut a "Tri-vided" chip that falls free in 3 pieces.

For general heavy-duty work, this is *Industry's No. 1 Saw*. And for other types of work, Simonds also makes Circular Metal Saws in Segmental, Solid-Tooth and Carbide-Tipped types. So ask your Industrial Supply Distributor to secure for you the *unbiased* consulting of a Simonds Saw Engineer.

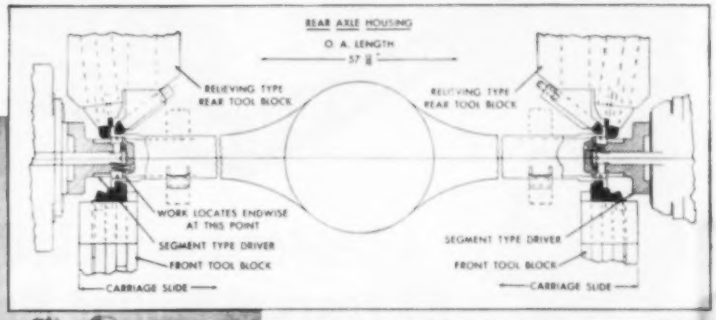
SIMONDS
SAW AND STEEL CO.

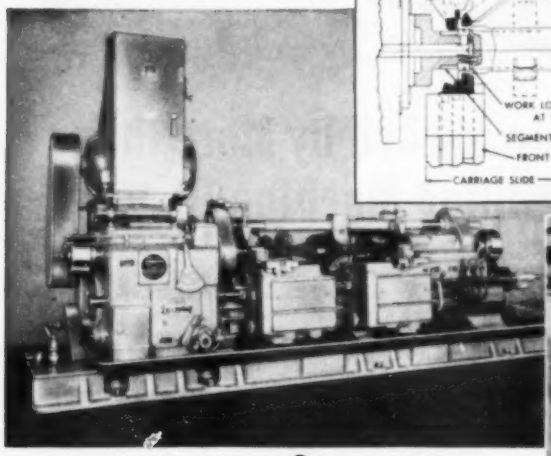
Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon. Canadian Factory in Montreal, Que. Southern Service Shop in Meridian, Miss. (formerly J. H. Miner Saw Mfg. Co.) Simonds Divisions: Simonds Steel Mill, Lockport, N. Y.; Simonds Abrasive Co., Phila., Pa. and Arvida, Que., Canada

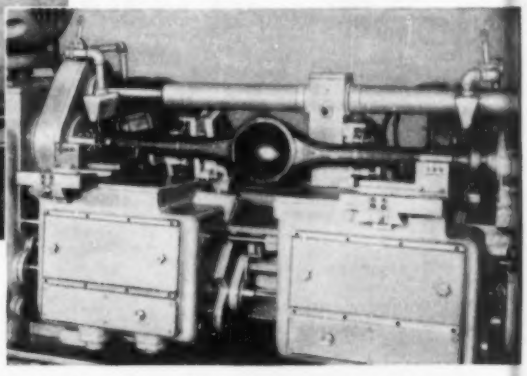
MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. **"THE Lo-swing PEOPLE"** SENECA FALLS, NEW YORK

see our catalog in
MACHINE TOOL CATALOGS
or write for copy







MODEL "AR" Lo-swing WITH DOUBLE END DRIVE CUTS MACHINING COSTS ON REAR AXLE HOUSING

Problem: To turn and face both ends of Rear Axle Housing simultaneously.

Solution: The Model AR Automatic Lo-swing Lathe selected for this job was equipped with a Double End Drive to secure a balanced, efficient drive and prevent torsional deflection of the Axle Housings while under cut.

The right-hand Head of the Double End Drive Mechanism is a massive, two-piece unit securely clamped to the ways of the bed. Its top part slides on large bearing surfaces and is pneumatically-operated to facilitate loading and unloading of the work. The large diameter drive shaft for this head is splined to permit free longitudinal movement of the sliding member, and is supported with a central bearing.

The close-up view above shows details of the tooling and also the two spring-loaded vibration dampeners which prevent vibration of the out-of-balance part when revolved at high speed. This view also shows the two front carriages; the left-hand carriage feeds towards the headstock while the right-hand carriage feeds towards the tailstock. The mechanism for reversing the feed on the right-hand carriage is enclosed in the housing shown on the extreme right-hand end of the bed in the overall view above.

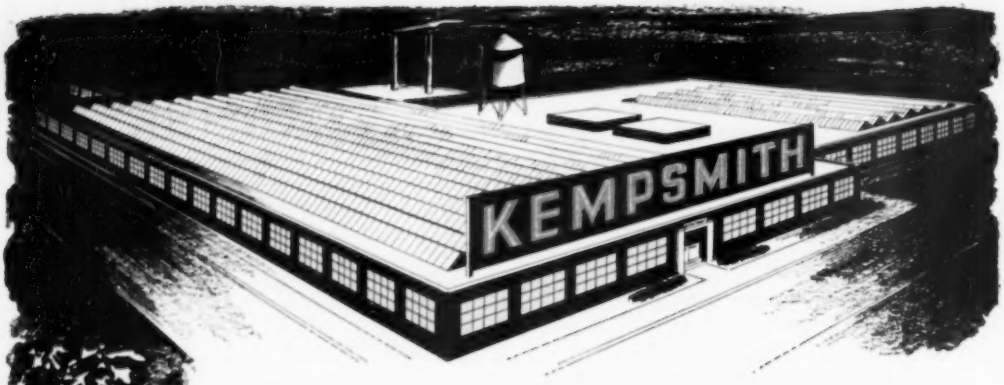
The axle housing is driven with two pneumatically-operated expanding segments...the air operating cylinders being mounted directly on the right and left hand Driving Head Spindles. Details of the tooling are shown in line drawing.

The operating cycle consists of loading the Axle Housing in two cradles, after which the sliding member of the right hand head advances and locates the housing endwise in relation to the driving chucks. This first movement is controlled by a four-way air valve at the right hand end of the machine. The second movement of this valve closes the two driving chucks. The machine is then started with the main clutch control lever located on the right side of the right-hand carriage, which is the normal operating position.

The automatic machining cycle then takes place and the machine stops automatically at the end of the cycle, ready for unloading and reloading. Consult Seneca Falls Engineering Staff on your turning problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing



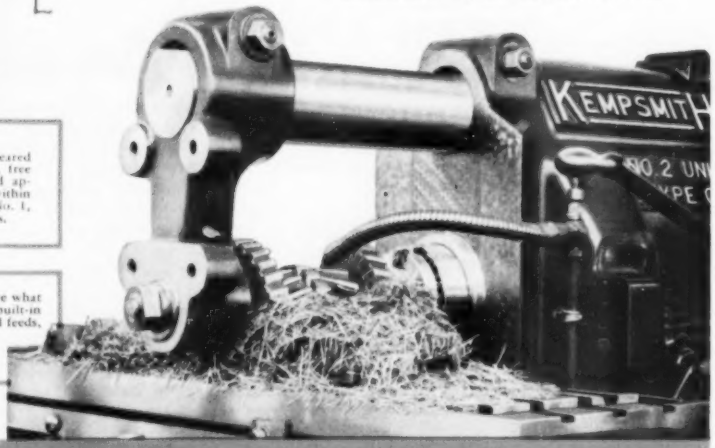
A Leadership Backed by More than 64 Years of Milling Machine History

Back in 1888, Kempsmith Engineers developed and produced the first Kempsmith Miller — a machine that was destined to achieve world-wide fame. The successful performance of this early model encouraged important engineering improvements and refinements resulting in much greater speed and precision in milling operations. Today, Kempsmith continues as a leader in the industry. The ruggedness, precision and ability to take heavy cuts smoothly make Kempsmith Milling Machines ideal for production, toolroom or general purpose milling. If you have a milling problem, consult Kempsmith. Our engineers will gladly give you the benefit of their broad experience in this specialized field.

THE KEMPSMITH MACHINE CO.
MILWAUKEE 14, WISCONSIN, U. S. A.

Kempsmith Type "G" Plain Miller. All geared for positive power and smooth cutting, free from chatter. Note rugged, streamlined appearance. All controls are grouped within easy reach of the operator. Available in No. 1, 2 and 5 sizes, plain and universal models.

Let the chips fly! Kempsmith Millers have what it takes for tough production battles — built-in ruggedness, increased range of speeds and feeds, greater power. Every machine is precision-built, the product of 64 years of milling machine experience.



KEMPSMITH

• Precision Built Milling Machines Since 1888 •

A-7270-1PG

Americans Are Rolling Up Their Sleeves!

YES, ALL KINDS OF PEOPLE ARE GIVING BLOOD SO THAT OUR WOUNDED MAY LIVE!

● Today, the blood of a Boston bookkeeper may be flowing through the veins of a wounded kid from a Kansas farm . . . the blood of a pretty Southern housewife may have saved the life of a grizzled leatherneck. For, blood is blood, a God-given miracle for which there is no substitute . . . and when a man's life hangs in the balance and blood is needed, there is nothing else to take its place!

Right now the need for blood is urgent. In hospitals —at home and overseas— many men require four and six transfusions during delicate operations. And the blood *must be there*—when it's needed. So give the most precious gift of all—*your* blood!

Be assured that giving blood is neither difficult nor distressing. And what a thrill there is in knowing that you've performed a really unselfish act! So call your local American Red Cross today and make an appointment. And tell your friends and neighbors about your experience. Let them share the wonderful feeling Americans get when they roll up their sleeves—and give blood.

But—

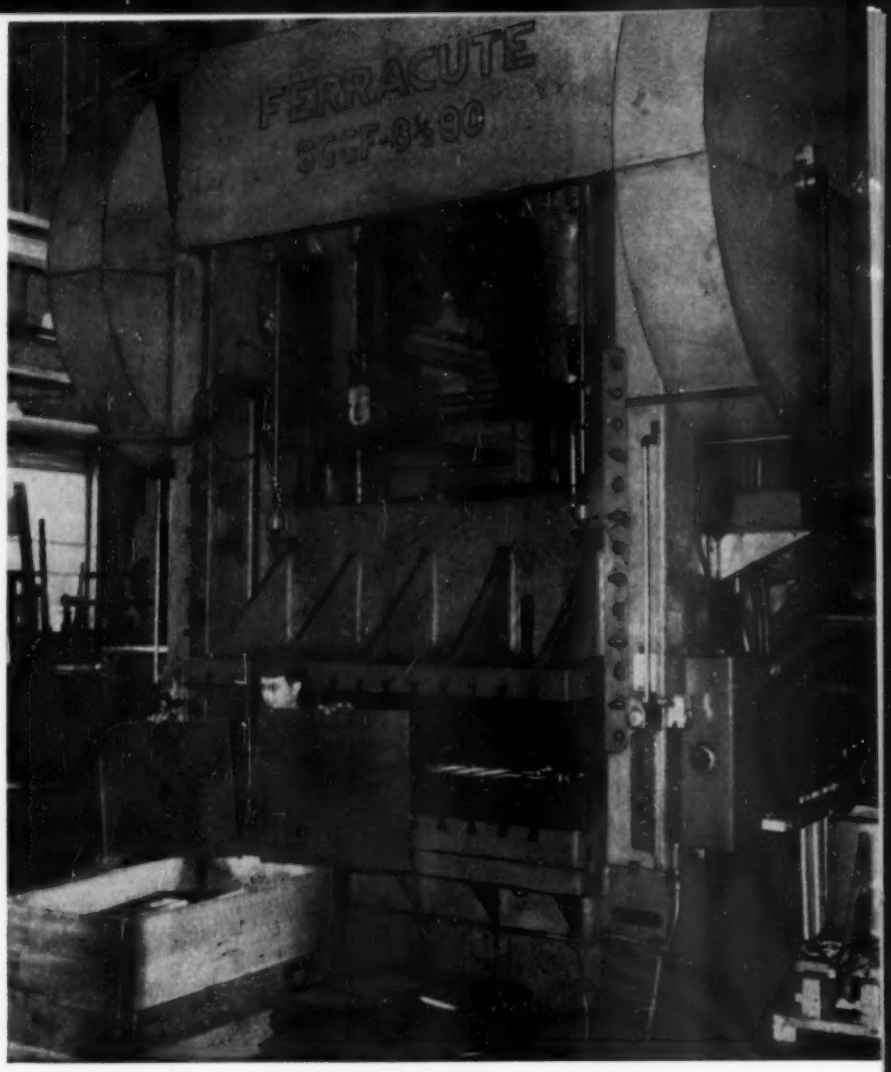
WHAT HAPPENED TO THAT PINT OF BLOOD YOU WERE GOING TO GIVE?

Call Your American Red Cross Today!

FERRACUTE STRAIGHT SIDED DOUBLE CRANK PRESS NO. SGGF—8½ 90

With one of the pieces it shapes at New Holland in two strikes, two at a time.

BIG GUN in New Holland's Cost-Cutting Program



From scratch in 1941 to one of the top producers in the field of farm machinery is the success story of New Holland Machine Co., New Holland, Pa. After a fast decade of expansion New Holland is now engaged in a cost-cutting program. Many operations have been speeded up and much fabrication that was formerly sent out is now being done in the New Holland plants. FERRACUTE STRAIGHT SIDED DOUBLE CRANK PRESS NO. SGGF—8½ 90 is the biggest and one of the newest presses in this program. Other FERRACUTE units play key roles in New Holland's production — as they have done for 89 years in so many important U.S. industries. Consider FERRACUTE to improve your own profit picture. We'll be glad to discuss your plans.

FERRACUTE
Since 1863

MACHINE COMPANY

Manufacturers of Power Presses and Special Machinery • BRIDGETON, NEW JERSEY, U.S.A.

SCHAERER

HIGH DUTY LATHES for PROMPT DELIVERY

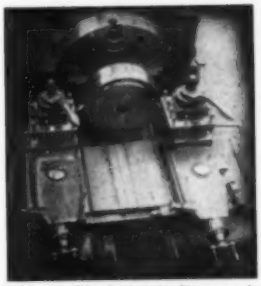
Built to the Highest American Standards of Accuracy, Productivity and Convenience

With the attachments available, these German-designed and built lathes represent the maximum in versatility . . . production lathes built to tool room standards, recognized universally for high precision and top performance.

Specifically, the SCHAERER HIGH DUTY LATHE offers:

- . . . all gears in headstock hardened and ground.
- . . . front and rear main spindle bearings lubricated by separate oiling system.
- . . . main shaft motor-driven through forward and reverse multidisc clutches.
- . . . multiple-screw cutting attachment provided on headstock.
- . . . quick-change gear and carriage equipped with one-shot oiling system.
- . . . carriage automatically released by friction clutch in case of overload.
- . . . cross slide equipped with ball catch stop for accurate adjustment of depth cutting.
- . . . adjustable carriage stop provided for longitudinal turning.

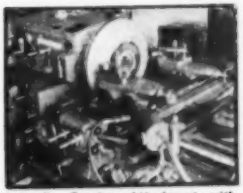
Full detailed specifications are contained in illustrated brochure available promptly on request.
Come and see these lathes in operation under power. Bring samples for test purposes if you wish.
Variety of tooling combinations available.



Twin cross slides for two simultaneous cuts.

Condensed Specifications

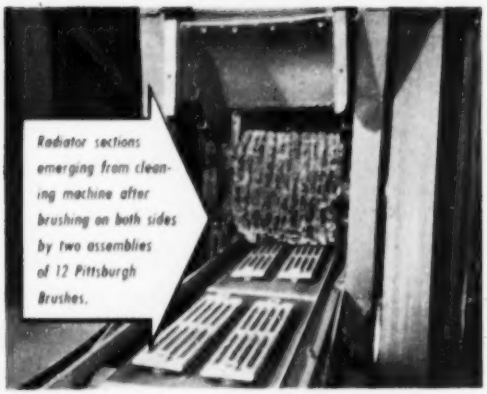
18" to 20" swing available.
20" to 22" swing over gap.
Distance between centers from 20" to 120".



Hydraulic Copying Attachment with twin cross slides for facing work and turning between centers.

M. B. I. EXPORT & IMPORT LTD.

475 GRAND CONCOURSE — MBI — BRONX 51, NEW YORK



Radiator sections emerging from cleaning machine after brushing on both sides by two assemblies of 12 Pittsburgh Brushes.

Pittsburgh Brushes can help you solve problems like these!

Cleaning Narrow Spaces—National Radiator Company, Johnstown, Pa., cleans 30,000 radiator sections a week! To insure a perfect final finish, even the narrowest spaces must be absolutely clean prior to assembly. Pittsburgh engineers were asked to design a brush that would reach these spaces and would fit National's existing machine. Successful? National reports: "Pittsburgh Brushes do a better job of cleaning and are more economical!"

Preparing Chills—At Continental Foundry & Machine Co., East Chicago, Indiana, chills used to cast iron rolls must be cleaned of the oxidized metal remaining from previous usage, as well as dirt and grease accumulated in storage. After experimenting with other brushes, Continental chose Pittsburgh because they "do the job better and stand up longer than any previously used!"

Improving Original Equipment—The Sommer and Maca Glass Machinery Co., Chicago, Illinois, uses Pittsburgh Brushes in the automatic washing machines they manufacture. Brushes formerly used simply didn't have the over-all density pattern needed. Pittsburgh engineers studied the problem and designed a brush which Sommer and Maca approved "because of (its) denser bristle pattern and lower cost."

WRITE TODAY FOR FREE BOOKLET!

Write today for a free copy of our booklet that shows, through actual case histories, how Pittsburgh cuts brushing costs. Address: PITTSBURGH PLATE GLASS COMPANY, *Brush Div.*, Dept. W-9, 3221 Frederick Ave., Baltimore 29, Maryland.

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Power Driven

BRUSHES

BRUSHES • PAINTS • GLASS • CHEMICALS • PLASTICS

PITTSBURGH PLATE GLASS COMPANY

FOR LIGHTNING-FAST LOW-COST PRODUCTION

Use the versatile

ELECTROPUNCH

WIDELY USED TO

STAKE

MARK

SWAGE

CUT OFF

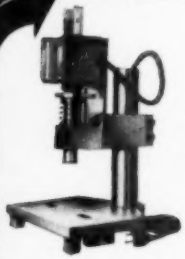
RIVET

CRIMP

BEND

PUNCH

DIMPLE



Produces up to 10,000 pieces per hr.!

For as low as $90.75, you can buy an ELECTROPUNCH (lightest model illustrated) and start increasing your small parts production. This low-cost, all-electric impact hammer features *controlled impact*. Ideal for steel stamping. Produces up to 10,000 pieces per hr. using automatic switching—up to 5,000 pieces per hr. with hand or foot switching.

Easy-to-use ELECTROPUNCH is portable, uses only one sq. ft. of bench space, plugs into any 115 V., A.C. outlet.

Write for descriptive folder.

BLACK & WEBSTER, INC.

Dept. 3, 445 Watertown Street, Newton 58, Mass.
Phone: Frank Webster — Bigelow 4-6370

YOU CAN DEPEND ON

Staples QUALITY

IN CIRCULAR CARBIDE-TIPPED TOOLS

Here's the tool that gives greatest economy for all types of hand and power driven line reaming or accurate piloted reaming, the Staples Carbide-Tipped Shell Type Expansion Reamer. To compensate for wear, the reamer shell is expanded to original diameter by driving it up the tapered arbor. A new tool is obtained simply by replacing the worn shell.

Ask the shops that use them! They'll tell you that Staples Tools are the tools with the built-in bonus of greater accuracy and better performance . . . that they produce more work, with greater precision, and with minimum servicing. For maximum return on your tool investment, put Staples Tools to work in your production.

THE STAPLES TOOL COMPANY, Cincinnati 25, Ohio

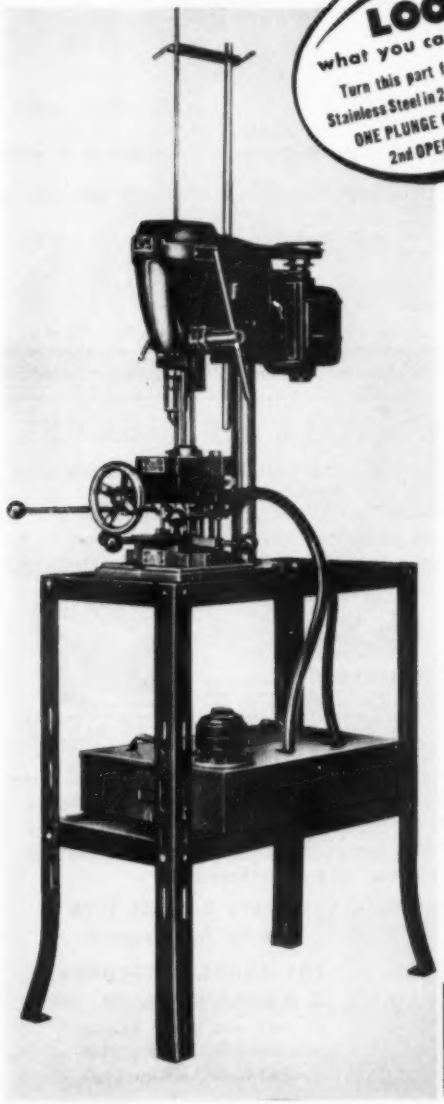
Distributors in Major Cities

Staples CARBIDE-TIPPED CUTTING TOOLS

A complete line of Circular-Carbide-Tipped Cutting Tools, Expansion Reamers — Special Tools

See it! Try it!

LOOK what you can do ... Turn this part from 5/16" Stainless Steel in 2 MINUTES with ONE PLUNGE CUT, and NO 2nd OPERATION!



Sounds impossible, and *is* with any other equipment. But the Karge TURNOMAT Machine does it, and makes it economical to turn a single part like this, or thousands of identical ones. No cams or special tooling of any kind are required—set up from one design to another takes just a few minutes.

The TURNOMAT has three independent cutting tools for turning, centering, forming, knurling, cutting off, etc. plus a ten position sliding turret adaptable for end operations, threading, tapering, drilling, centering, reaming, and for stops for shoulder to shoulder turning operations.

The NEW Karge TURNOMAT—

The Vertical, Self-Contained and Complete Machine which turns parts such as shafts, spindles, bushings, studs, etc. to unlimited lengths and diameters, with high precision and a mirror-like finish without extra machining. (See above)

MAKES POSSIBLE PRODUCT RE-DESIGNING, HUGE SAVINGS!

With this Karge TURNOMAT Turning Machine you can produce parts that it has heretofore been impossible to produce with *any equipment*, regardless of its cost! Many manufacturers have been able to save tremendous amounts by redesigning certain costly parts, producing them with the Karge TURNOMAT attachment on lathes. Now we offer all the advantages of that equipment, in a *complete* machine—you don't have to release a lathe from other important work.

This Karge Vertical Precision Turning Machine is completely equipped and motorized including a coolant pump and an oil pan. It is available in two sizes—$\frac{3}{8}$" maximum round bar capacity, and 9/16" round bar capacity. It is also available for lathe application up to $2\frac{1}{4}$" round bar capacity.

COST — AMAZINGLY LOW

The claims we make would lead you to expect a very high quality precision machine—RIGHT. And also you'd expect it to cost *plenty*—WRONG. Please write to us for more complete information and prices. Quality is absolutely guaranteed.

Capacity: 1/16" to 1" round bar stock.

U.S. Patent No. 2,464,813. Other U.S. and foreign patents pending.

YOU CAN MAKE US PROVE HOW GOOD KARGE TURNOMAT IS!

Send us a sample or blueprint of a job you are now doing (or would like to do). Without obligation we'll duplicate it (or furnish one very similar) and send it to you with complete data as to equipment and model TURNOMAT used, and time it took to produce it. Send today—you can't lose. *Write to Dept. AM.*

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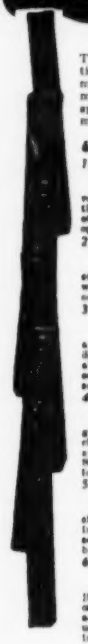

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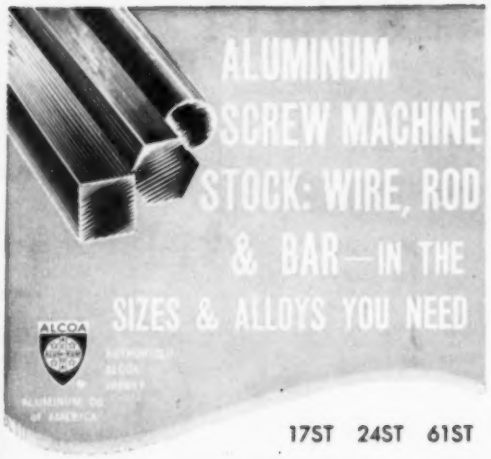

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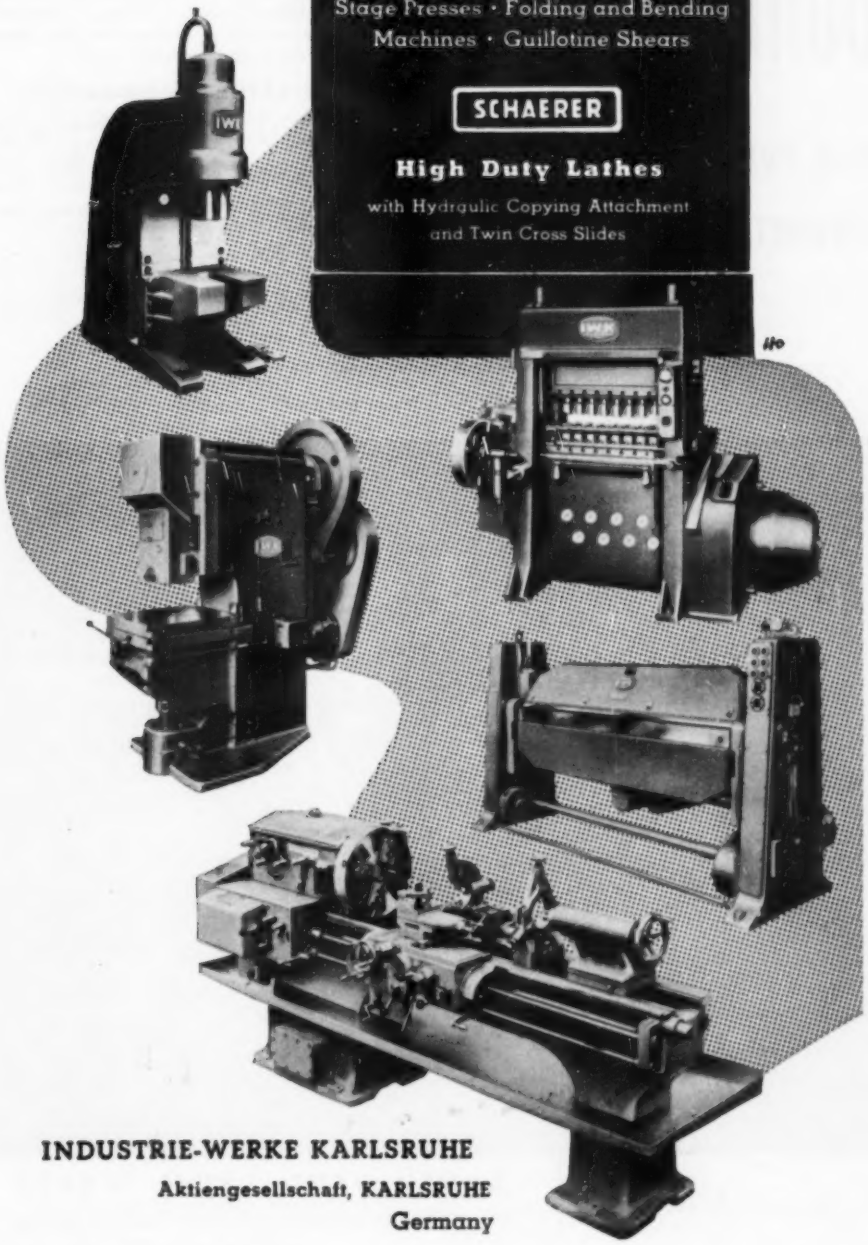

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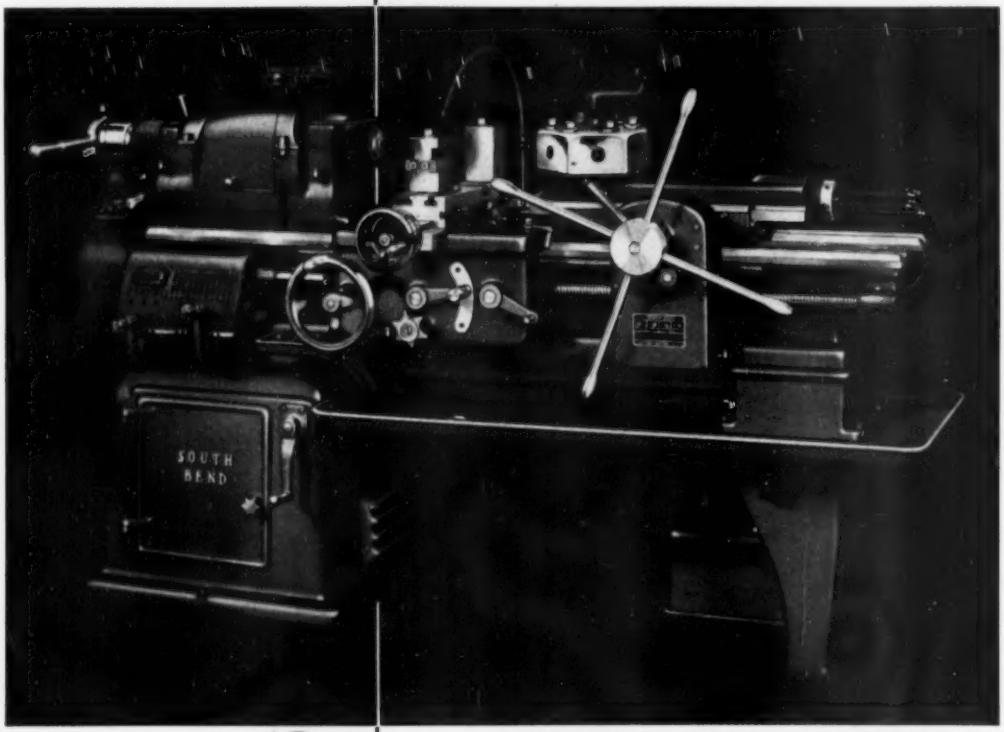

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To the advertiser who contemplates using the magazine as an advertising medium, this symbol has a well-recognized significance. It tells him that the circulation records and practices of the magazine are wide open to the auditors of the Bureau, who check the publisher's claims and make public the precise terms and conditions under which subscriptions are obtained. And it assures him that the magazine stays in business by virtue of a demonstrated demand from its readers as shown by their paid subscriptions or newsstand purchases.

BUT HERE we are concerned only with the significance of ABC to you as a reader. For when the advertisers, the advertising agencies, and the publishers founded the Bureau nearly forty years ago to help establish honest circulation figures, they unwittingly set up a cooperative institution that has become a major safeguard for the interests of the reading public.

That is because membership in ABC constitutes one of the strongest guarantees that any publication can offer of its primary devotion to the interests of its readers. And by making that guarantee possible, ABC becomes a major safeguard of the freedom of the press, an objective of exceptional importance in these days when the public is flooded with propaganda from so many sources.

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TO SUPERVISE this vital process, to check and certify the integrity of the publication's circulation methods and claims, requires a strict and continuing audit of each publication's success in meeting this test of its public acceptance. To that essential function the ABC has contributed mightily by the conscientious performance of its mission. And that is why we are able to have a press supported, for the most part, by advertising revenues, but not controlled as to its circulation or content by any influence other than its readers.

When an advertiser consults the ABC statement of a publication to ascertain the amount, the quality and the trend of its circulation, he does so in the legitimate pursuit of his own interest. But at the same time, inevitably, he is helping the ABC to keep the press responsible and responsive to the reading public. For, in effect, he is asking the publication to demonstrate through its circulation figures that it owes its standing to a voluntary demand by its readers.

SO THE Audit Bureau of Circulations, by auditing and certifying paid circulations, has come to perform a vital service to the readers of this magazine and of every other member publication. And in performing that service, it helps to maintain in our country a press that is answerable to the reading public and to it alone. So long as the practices and principles for which ABC stands continue to prevail in American publishing, we shall find in it a sure support for a truly free press, responsible only to the public it serves.

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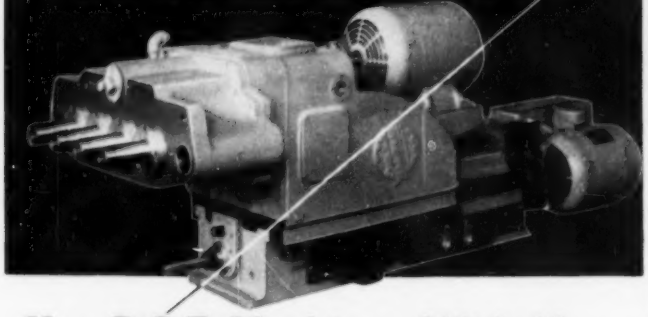

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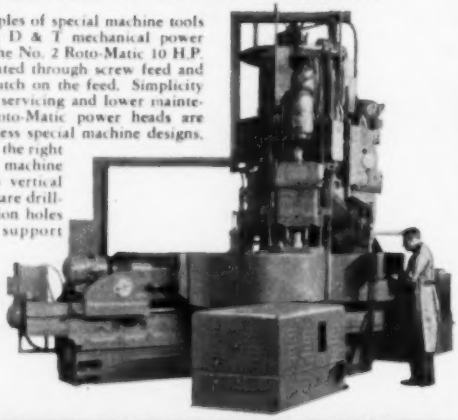

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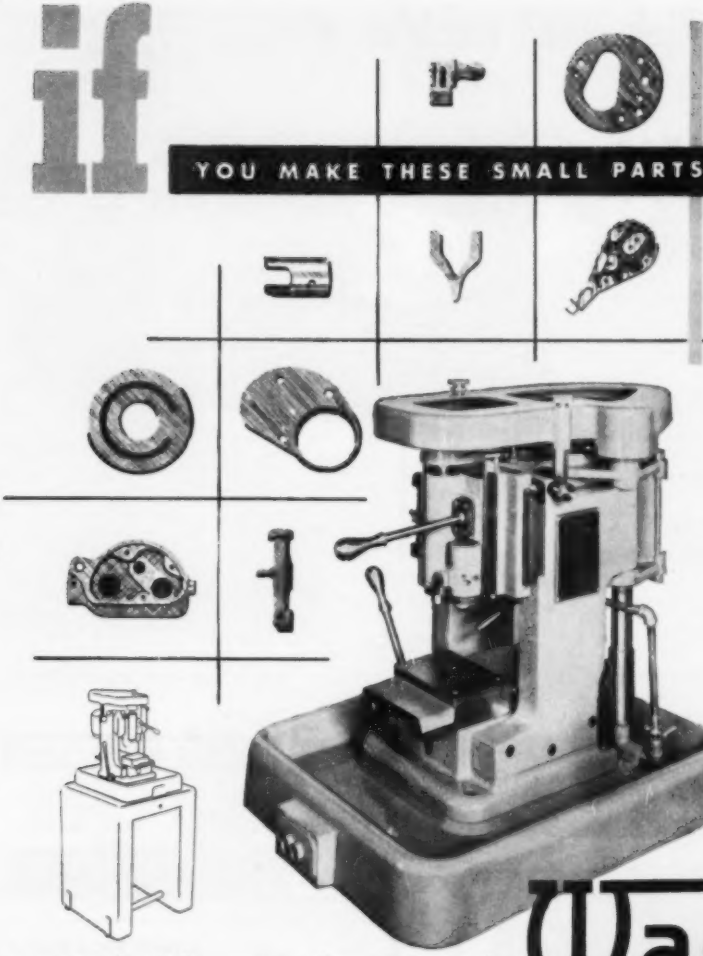

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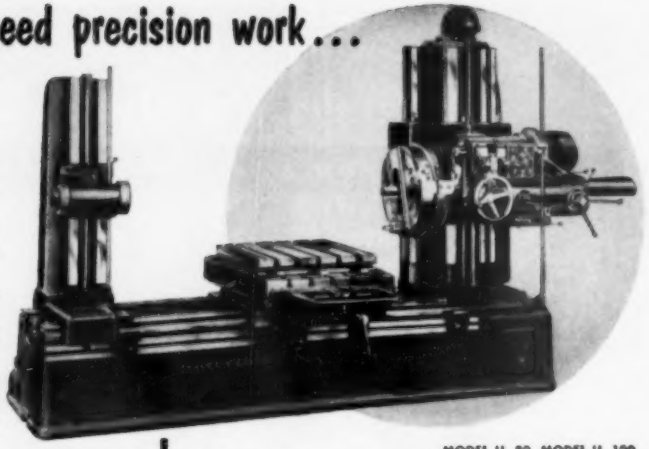

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Spindle diameter	3 1/32"	3 15/16"
Spindle traverse	31 15/32"	39 3/4"
Spindle speeds	18	18
Facinghead speeds	6	9
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Motor	7 HP	13 1/2

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See pages 50-51 Nov. 10th, American Machinist

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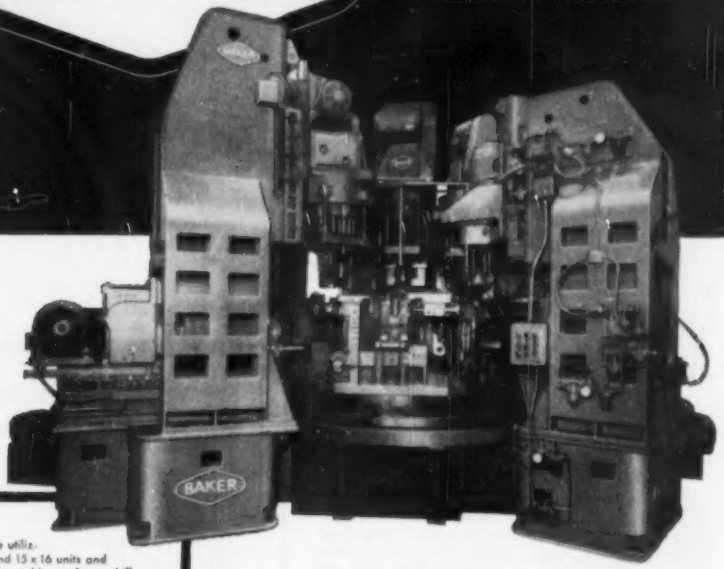
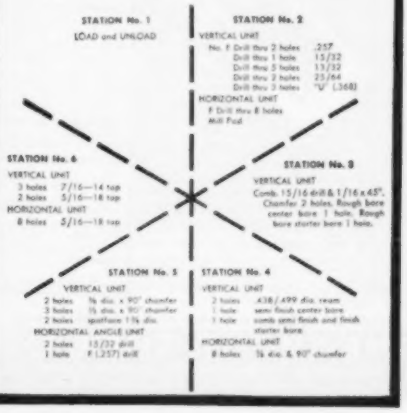


Baker Multi-Operation Machine utilizing standard Baker 7½ x 16 and 15 x 16 units and a 72" six-station power indexing table, performs drilling, chamfering, boring, counterboring, and tapping operations on clutch housings at the rate of 80 parts-per-hour at 100% efficiency.


STATION No. 1
LOAD and UNLOAD
STATION No. 2
VERTICAL UNIT
No. F Drill thru 2 holes .257
Drill thru 1 hole 13/32
Drill thru 5 holes 13/32
Drill thru 2 holes 25/64
Drill thru 2 holes "V" (.368)
HORIZONTAL UNIT
F Drill thru 8 holes
Mill Pad
STATION No. 6
VERTICAL UNIT
3 holes 7/16—14 tap
2 holes 5/16—18 tap
HORIZONTAL UNIT
8 holes 5/16—18 tap
STATION No. 3
VERTICAL UNIT
Comb. 15/16-drill & 1/16 x 45°. Chamfer 2 holes. Rough bore center bore 1 hole. Rough bore starter bore 1 hole.
STATION No. 5
VERTICAL UNIT
2 holes 1/8 dia. x 90° chamfer
3 holes 1/8 dia. x 90° chamfer
2 holes spotface 1 1/8 dia.
HORIZONTAL ANGLE UNIT
2 holes 13/32 drill
1 hole F (.257) drill
STATION No. 4
VERTICAL UNIT
2 holes .438/.499 dia. ream
1 hole semi-finish center bore
1 hole comb semi-finish and finish starter bore
HORIZONTAL UNIT
8 holes 1/8 dia. & 90° chamfer

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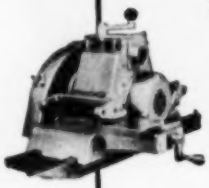
Models Available for ALL SHOP NEEDS!

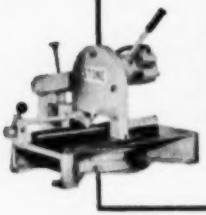
← MODEL M-75

A floor model, 2½' x 4' equipped with full 7½ h. p. geared-in-head motor engineered with positive drive, will cut all ferrous and non-ferrous solids up to 2½"—pipe and structurals up to 4". Can be furnished equipped for wet cutting.



← MODEL SS-20

Operates on guided rails for cutting larger structural steel, plate, sheet, with cuts up to 10 feet in length. Cuts wet or dry.



← MODEL M-14

32" x 34" Bench Model. This mighty little brute, with full 3½ h. p. geared-in-head motor engineered with positive drive, will cut all ferrous and non-ferrous solids up to 2"—pipe and structurals up to 2½". Two models—straight cut-off and swivel head for angle cutting to 45°. Legs available.

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ONE OF THE FINEST ENGINE LATHES MADE IN THE UNITED STATES TODAY

PROMPT DELIVERY

PORTER McLEOD
16" Geared Head Quick Change Screw Cutting Engine Lathes
6'—8'—10' Lengths

PARTIAL SPECIFICATIONS

Distance between centers (6'): 36"; (8'0): 60"; (10'): 84". Hole through spindle: 1-5/16". 12 spindle speeds, 23.6 to 1000 RPM. Anti-friction bearing headstock. 5 HP motor.

Sales territories open

Rigid and vibration-free, the Porter McLeod lathe is the product of a 60 year old company. More than 2500 are in service! All headstock gears are made of specially hardened chrome nickel steel. The spindle, also of chrome nickel steel, is forged and bored from solid stock, mounted front and rear on Timken roller bearings.

Many desirable features are incorporated in this precision lathe which is distributed exclusively by MOREY . . . Includes tailstock of cutaway pattern, taper gibbed compound rest. Lead screw has a chasing dial allowing operator to catch any thread at the beginning of each successive cut, while the feed rod is equipped with an adjustable automatic stop.

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MOREY *for machine tools!*

MOREY MACHINERY CO., INC.
Manufacturers • Merchants • Distributors
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ENDS TAPPING TROUBLES

Ultra Precision THREAD-CUTTING BROACHES deliver these advantages:

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- Ground from hardened high-speed solid blanks.
- Require only half the power needed for tapping.
- Have an amazing long life.
- May be resharpened many times.
- Feed the chips out of the hole.
- Lower production costs.
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SHEARCUTTER TOOLS COST LESS IN THE LONG RUN

These ultra-scientific cutting tools are used by practically every large manufacturing company in the U.S.A. Constant repeat orders prove their merit and value.

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SHEARCUT TOOL CO.
MANUFACTURERS OF THE WORLD'S MOST SCIENTIFIC CUTTING TOOLS
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IVAN is watching you

IVAN is a dyed-in-the-wool Communist. There are only 6 million party members like him in all Russia, yet these Communist brass-hats enforce the iron dictatorship of the Kremlin *over 200 million* Russians.

He's sold to the hilt on Red ideas. Which means he's out to get *you*. He believes it's either you or him . . . that the world is too small for both.

Ivan is working hard to beat you down. He has a big head start.

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Ivan is afraid of only one thing.

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In reply give full details of record and requirements—and when available.

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SALES ENGINEER—Taps, Drills and Reamers. Familiar with New Jersey territory. Trenton north. This man must be capable of recommending the right tool for the job. Exclusive rights guaranteed drawing account from $10,000 to $15,000 per year against commissions. SW-5944 American Machinist.

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AUTOMATIC, #900G Brown & Sharpe, M.D.
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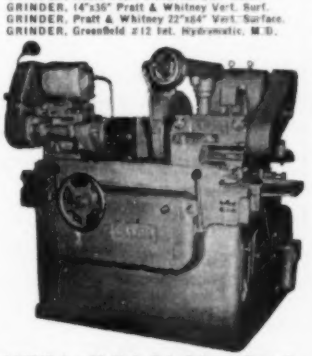
AUTOMATIC, Nami #2 B & S Wire Feed, 1" screw.
BALANCER, Anderson Bros. 14"x66", Roto-Checker.
BORING MILL, 24" Bullard M.D., V.T.L.
BORING MILL, 36" Bullard M.D., V.T.L.
BORING MILL, 36"x46" Nites Vert. M.D., Side Head
BORING MILL, 40" Bullard M.D., 2 Heads
BORING MILL, 10' Cinci-Vert., M.D. 2 heads.
BORING MILL, 2¼" Lucas Horiz., M.D.
BORING MILL, Lucas Horiz. 3" Bar, M.D.
BORING MILL, Giddings & L. #6 Horiz. 3½" Bar.
BARRELS, Tumbling Lunomatic, Schutte & Koerting.
BROACH, #1 LaPointe Horiz. 50" Str., M.D.
COMPRESSOR, Ingersoll Rand ER-1, 10 HP, M.D.
COMP., 15 HP, 10 HP, Gardner Denver, M.D., New
COMPRESSOR, C-P 50 HP., M.D., 10x10, 270 CFM.
COM., Ing.-Rand ER-1, 100 HP Syn. M.D.
CRANE, GET Ricker 2 bms 11'9" span.
CRANE, Canton #8 Portable Gooseneck 3 ton cap.
CHIP WRINGER, Garrett #251, M.D., 18" dia.
CHIP WRINGER, 20" Tolhurst M.D., Late.
GAS CUTTER, Airco #4 & #10 DB Radiagraph.
RADIAL DRILL, 3'x9" Mueller, M.D.
RADIAL DRILL, 4'x11" American, M.D.
RADIAL DRILL, 5'13" Cincinnati-Bickford, M.D.
RADIAL DRILL, 6'x15" Cincinnati-Bickford, M.D.
RADIAL DRILL, 36" Walker Turner M.D., Late
DRILL, Fosdick 16", S.S. Power Feed, M.D.
DRILL, #2 Colburn H.D. #4 M.T., M.D.
DRILL, #121 Baker Auto., S.S. Cam Operated.
DRILL, Deep Hole, Avey-Draulic #2, M.D.
DRILL, Deep Hole, Pratt Whitney #2 Gun Barrel.
DRILL, Edlund #2B, 3 spdle. #2 M.T., 16".
DRILL, 4 & 6 Sp. Avey 12" overhang, #3 M.T., M.D.
DRILL, 4 Sp. Barnes H.D., M.D. #4 M.T., P.F.
DRILL, Cincinnati 21" with Tapairy Attach. M.D.
DRILL, Natco Multiple Spdle. #12, #1 M.T., M.D.
DRILL PRESSES, Leland Gifford #1MS, 1, 2, 3, 4
DRILL PRESS, #2MS Buffalo Forge sing'e spindle.
DRILL, Barnes, 24" S.S., #4 M.T., 1¾" cap.
DRILL PRESS, #2S Foote-Burt S.S. 24", #5 M.T.
DRILLS, #14, #15, #16, #18 Buffalo Forge, M.D.
DEEPFREEZE Motor Products 40 below zero.
DEMAGNETIZER, SB-611 Magnaflux, late type.
FACING HEADS, 20" & 24" Mummert-Dixon.
FILER, #11-S Cochrane Bly Auto Saw Filer.
FILER, #11-S Type P4, Floor Type, M.D. Theil
FURNACE, Westinghouse Elec. 15 KW, 2100° F. cap.
FURNACE, Machler Steam Oven, Serial #3543.
GRINDER, #1 Wilmarth Norman Hand Surf., 6"x12".
GRINDER, #2 Imperial Univ. Tool & Cutter, New.
GRINDER, #4 G & L Univ. Tool & Cutter, M.D.
GRINDER, Disc, Besly #205, 18" Dble. End.
GRINDER, Heald Rotary #25, M.D. 16" Cap.
GRINDER, Cylindrical, Norton 10"x24", M.D.
GRINDER, Brown & Sharpe #4 Univ. 12"x60".
GRINDER, #13 Brown & Sharpe Univ. Tool and Cutter, late.
GRINDER, Thread, Jones & Lamson #TG-615, Late.
GRINDER, Heald #72A-3 Internal Size-Matic.
GRINDER, 14"x36" Pratt & Whitney Vert. Surf.
GRINDER, Pratt & Whitney 22"x84" Vert. Surface.
GRINDER, Greenfield #12 Int. Hydromatic, M.D.

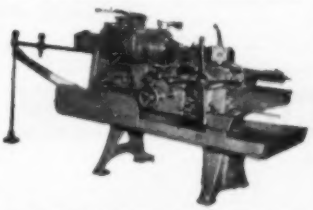


LANDIS 6 x 18 Hyd. Cyl. Grinder, Type C. Serial #29196.

GRINDER, Oliver Auto. M.D. Drillpointer.
GRINDER, #33 Abrasive Vert. Auto. Surface, M.D.
GRINDER, #22 Heald Horiz. Rotary Surface, M.D.
GRINDER, Diamond Snagging 10 HP, 24"x6½",
GRINDER, #2 Norton Univ. Cutter & Tool, late.
GRINDER, Norton 6x18 Vert. Surface, Hyd. Late.
GRINDER, #60 & #70 Heald Internal.
GRINDER, Landis 6"x18" Hyd. Cyl. late type, M.D.
GRINDER, Sellers Type #1A Tool, 24" wheel.
GRINDER, 37" Wheel Dia. Osterholm Disc, 24" cap.
GRINDER, M.G. Sanford Surf. 8"x12" cap., New.
GRINDER, 30" Ingersoll Tub Face Mill, M.D.
PROFILE GRINDER, Studer Type PSM, M.D., late.
GEAR HOBBER, #3 Barber Colman, M.D.
GEAR SHAPER, Fellows #6 High Speed, M.D.
GEAR SHAPER, Fellows #7 High Speed, M.D.
HAMMER, Rochester Hipped, all sizes, M.D.
HAMMER, Bradley 200# Rubber Cushioned Helve.
HEADER, Manville #1 S.S.R.D. Cold 3 /16".
INDUCTION HEATER, 10 KVA Ecco Hi Frequency.
INDUCTION HEATER, 30 KW Lepel, Late Type.
ASR MOTOR HOIST, Ingersoll Rand 2000# cap.
ELECTRIC HOISTS, 500-4000 lbs. Whiting, NEW.
HOIST, 5 ton capacity Shepard Electric.
HONE, #194 Barnes Vertical, M.D., Hyd. Late.
KEYSEATER, #5 Mitts & Merrill, Giant, M.D.
LAPPER, 2F Norton Vert., M.D., late type.

DISC GRINDERS

Osterholm 37" Wheel Diameter Disc Grinder, 40 HP, TEFC 3/60/440 spindle motor drive. 24" capacity.



#4 WARNER & SWASEY Geared Head Turret Lathe, Motor Driven, Bar Feed, Taper Attachment.

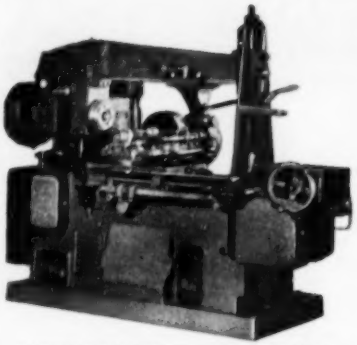
LATHE, Le-Swing 8"x100", M.D., A.C. Rebuilt.
LATHE, Porter-Cable 9"x15" Geared Head Prod.
LATHE, Hendey 12"x5' Q.C.G., Taper Attach. M.D.
LATHE, LeBlond 14"x6', Q.C.G. M.D.
LATHE, Hendey 14"x8' Q.C.G. Taper Attach. M.D.
LATHE, Lodge & Shipley 16"x6', Q.C.G., Grd. Hd.
LATHE, American 16"x8' Q.C.G., Grd. Hd. M.D.
LATHE, Lehman 18"x7' Q.C.G., M.D.
LATHE, American 18"x10' Q.C.G., Grd. Hd.
LATHE, South Bend 18-28"x8' Gap Bed, Q.C.G. M.D.
LATHE, Hendey 20"x10' Q.C.G., Taper Att. M.D.
LATHE, Reed-Prentice 20"x10' Grd. Hd. M.D.
LATHE, LeBlond 22"x10' Q.C.G., M.D.
LATHE, 24"x12' Boye & Emmes Grd. Hd., T.A., Late.
LATHE, Putnam 24-32"x12' Q.C.G., M.D.
LATHE, LeBlond 24"x14' Q.C.G., Grd. Hd.
LATHE, Lodge & Shipley 29"x14', Q.C.G., M.D.
LATHE, McCabe 26-40"x18' Double Spindle Lathe.
LATHE, Bridgeford 22"x12' Geared Head, M.D.
LATHE, Bridgeford 12"x16' Q.C.G., Grd. Hd.
LATHE, Bullng Dble. End #WBTS, Devine Bros.
LATHE, Turret #1 Bardons & Oliver Electric Head.
LATHE, Turret, #2 Simmons Vari Drive 220 V.
LATHE, Turret, #4 Warner & Swasey Univ. 1½".
LATHE, Turret, #6 Warner & Swasey Grd. Hd. Ram Type, Bar Feed, Motor in base.
LATHE, Turret #2 Cinci. Acme Univ. Geared Head.
LATHE, Turret, #1A Warner & Swasey Univ. M.D.
LIFT TRUCKS, Baker 1 & 2 ton, Platform & Fork.
MILL, #4 Burke Motor Driven, Late, M.D.
MILL, #2 Pratt & Whitney Prod. Duplex, M.D.
MILL, #4B Brown & Sharpe H.D., Horiz. M.D.
MILL, #14 Garvin Plain Horiz., M.D.
MILL, #0Y Brown & Sharpe Plain Horiz., M.D.
MILLING MACHINE, #2B K & T Horiz., M.D.
MILL, Cinci. Horiz. #3, #4, #5 High Power, M.D.
MILL, #1 Brown & Sharpe Plain Horiz., M.D.
MILL, 20-8 Cinci. Vert. Prod. Late, M.D.
MULT-MILLER, U.S. Tool #MM-1-5, Auto. Prod.
MILL, 20 Vernon Hand Mill, M.D. Late.
MILL, 2A Brown & Sharpe Horiz. Univ., M.D.
MILLING MACHINE, Kempsmith #2 Horiz. Univ.

No. 700 ESPEN LUCAS Hydraulic Heavy Duty Cut-off Saw, new 1945.

MILL, #3 Cinc. Univ. Horiz., M.D.
MILLING MACHINE, LeBlond #4 Horiz. Univ.
MILL, #2 Vert. M.D. Brown & Sharpe.
MILL, #3 Cinci. Vertical Hi Power, M.D.
MILL, #4 Cinci. Vertical Hi Power, M.D.
MILL, #3C Becker Vert. Die Sinker, M.D.
MILLING MACHINE, #2 Van Norman Duplex, M.S.
MOTOR GENERATOR SET, Gen. Electric, 100 K.W.
NIBBLER, Gray Turret Type 1/4"x24" cap. M.D.
THREADING, Staybolt Lassiter Millholland 1½",
THREAD MILL, 2½x11 Hanson-Whitney, Univ.
THREAD MILL, 6x14 Pratt & Whitney No. 1105.
THREAD MILLER, Lees-Bradner #40A Automatic.
THREAD MILLER, Plan-O-Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine, Late.
PAPER SHREDDER, No. 10 Mitts & Merrill, M.D.
PLANER, Cincinnati 30"x30"x12' A.C., M.D.
POWER PRESS, Bliss #164 Open Back, M.D.
POWER PRESS, Bliss #3A S.S. Dble. Crank Grd. 45 tons, 4" stroke, 36"x26" Bed Area, M.D.
POWER PRESS—Bliss-Consolidated #163-B Straight Side Dble. Crank 45 tons, M.D.
PRESS, #7A Thomas O.B.I. 80 ton cap.
PRESS, #163 Toledo Toggle Drawing, M.D.
PRESS, 150 ton Clearing Single Crank 9" Str., Late.
PRESS, 70H Drake Hydraulic Arbor, New.
PRESS, #70½ Bliss S.S. 9½ Str., M.D.
PRESS, Federal #2 O.B.I. Grd. 2" Bore.
PRESS, Bliss #16, #19, #20, #21, #01, A.C., M.D.
PRESS, Waterbury-Farrel High Speed 60 tons #3W.
PRESS, 60C Bliss Double Action, 5 crank.
WHEEL PRESS, 300 ton Hydrostatic, 48"x18", M.D.
WHEEL PRESS, Chambersburg 400 ton cap. Hyd.
PRESS, Lucas 15 tons Power Arbor, M.D.
PRESS, #88 Whitney Deep Thr. 24", foot.
PRESS, #2, #3 Ferracute M.D. Roll feed.
PANTOGRAPH, #1A Gorton M.D. Engraving
PUNCH, #46 Buffalo Forge Vert. Cap. 1"x14", M.D.
PUNCH, R-4 Wiedemann Turret, 10 Stat. 24" thr.
PUNCH, Hecker Turret, 8 station, cap. 2½" hole.
PUNCH, H & J #2 Sgle. End, 24" Thr. 1" thru 1".
PUNCH, H & J #5 Sgle. end, 48" Thr. 2" thru 1½",
RIVET SETTER, ¾" cap. Pene. Tubular Rivet.
ROLLS, Bertsch Pyramid 16'x14" cap. M.D., Late.
ROLLS, #1 Buffalo Forge Wrapping, M.D.
COLD SAW, Wagner 16"x16" cap., M.D.
COLD SAW, Espen-Lucas #700, 48" dia. blade, M.D.
CUT-OFF SAW, Yates-American #M-90, M.D.
SAW, #4B Marvel Mark Saw 6"x6" Cap., M.D.
SAW, #8 Marvel Band 18"x18" cap., M.D.
SAW, #302 Campbell Abrasive Cut-off, M.D.
SAW, #20-C Racine Shear Cut 6"x6" cap., M.D.
SAW, Band, Tannewitz GH-36" High Speed, M.D.
SHAPER, 16" Pratt & Whitney Crank, M.D.
SHAPER, 20" Rockford Univ. M.D., Tilting Table.
SHAPER, G & E 24", high duty, back geared, M.D.
SHAPER, 32" Cinci. B.G., Motor driven, M.D.
SHAPER, Morton 36" Draw-Cut, 4 Speed, M.D.
SHEAR, #642 Niagara 42"x¼" cap., 15" cap., M.D.
SHEAR, #35 Buffalo Forge Slitting Armor Plate.
SHEAR, Quickwork #11 Rotary 66" Throat, 10 ga.
SHEAR, #8E Niagara M.D. 8"x3 /16" cap. M.D.
SCREW SLOTTER, #2 Waterbury Farrel Auto. M.D.
SCREW SLOTTER, #117 Keet, M.D., Late.
SLOTTER, 12" New Haven Vertical, M.D.
SPRU CUTTER, Milwaukee 56 tons, 2½ cap. M.D.
SURFACE PLATES & TABLES, all sizes.
TAPPER #1 CAM Haskins, Motor Driven, Late.
TAPPER, #1 Bakewell (Warner & Swasey) Late.
BRINELL, Tester Machine, Type UK500W, Steel City.
BRINELL, Tester Machine, Type 6SDR, Steel City.
WELDER, 500 amp. Westinghouse Fleetarc A.C.
WELDER, 200 & 400 amps. Gen. Elec. Portable Arc.
WELDER, 200 KVA Federal, Projection.
WELDER, 75 KVA Federal, M.D., Spot.
WIRE STITCHER, Merrion and Acme, M.D.

OVER 2000 MACHINE TOOLS AVAILABLE IN STOCK

GEAR EQUIPMENT — STOCK DELIVERY!



BARBER COLMAN Type "A" Gear Hobber

BARBER COLMAN Type "A" Gear Hobber; late type
BROWN & SHARPE No. 6-72 Auto. Gear Cutter
GOULD & EBERHARDT No. 12H Univ. Gear Hobber; late
GOULD & EBERHARDT No. 18H Univ. Gear Hobber
GOULD & EBERHARDT No. 36BM 3-spdle. Gear Rougher
KOEPFER Model WM-11 Auto. Gear Hobber; late type
MICHIGAN Model 854 Rack Type Gear Shaver; late type
MICHIGAN model 862-24-A Gear Finisher; late type
PFAUTER Model RS-1 Univ. Gear Hobber; late type

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MOREY MACHINERY CO., Inc.
Manufacturers • Merchants • Distributors
410 BROOME ST. • NEW YORK 13, N. Y.
Telephone: CAnal 6-7400

LATE MODEL MACHINE TOOLS . .

AUTOMATIC SCREW MACHINES
No. RA-6 9-16" Acme Gridley, 1942
No. RA-4 1¼" Acme Gridley, 1943
2" Model A Cleveland, 1942
1-1/16" Model "A" Cleveland, 1943
No. 00G Brown & Sharpe, 1942

BROACHES
HP—100 La Pointe Hyd. Horizontal, 1945
5 ton 36" Sf. La Pointe Horizontal, 1942

GEAR EQUIPMENT
No. 7 Gleason "Revex" Rougher, 1943
No. 6 Gleason Revacycle Generator, 1943
No. 72 Fellows H. S. Gear Shaper, 1942
10" Pratt & Whitney Hyd. Gear Grinder, 1942
Red Ring Universal Gear Checker, 1947
20M Fellows Red Liner Gear Tester, 1942

GRINDERS, CYLINDRICAL
16"x72" Norton Plain Type "C", 1941
16-20x36" Norton Plain Type "C", 1942
14"x168" Norton Plain Type "C", 1942
12"x80" Fitchburg Plain Hyd. 1942
12"x48" Cincinnati Universal, 1942
10"x18" Landis Plain Type "C", 1940

GRINDERS, INTERNAL
No. 72A3 Heald Plain Hydraulic, 1942
No. 24-36 Bryant Hydraulic, 1943
No. 16 CP 16 Bryant Hydraulic, 1942
No. 16-16 Bryant Hydraulic, 1942
No. 172 Heald Hydraulic, Gap, 1940

GRINDERS, RADIUS
No. 71 Van Norman Radius Grinder, 1942

GUN BARREL MACHINES
No. ½B x 30 Pratt & Whitney Rifler, 1942
No. ½B x 30 Pratt & Whitney Reamer, 1942
No. ½B x 30 Pratt & Whitney Reamer, 1942

LATHES, ENGINES
36"x296" American Geared Head, M.D.
30-48x158 Safop Gap Lathe, New.

27"x102" Niles "Timesaver" Lathe, 1941
27"x210" Lodge & Shipley Gap Lathe, 1940
26"x180" Betts Bridgeford Lathe, 1940
26"x96" Betts Bridgeford Lathe, 1940
25-45x120 Oldfield-Schofield Gap, New

LATHES, PRODUCTION
No. 5D Potter & Johnston Automatic, 1941
No. 4D Potter & Johnston Automatic, 1942
8"x84" Lo-Swing Semi-Auto, 1941
Lipe-Carbo-Matic, Lathe, 1942

LATHES, TURRET
No. 1L Gisholt Universal Saddle Type, 1942
No. 3R Gisholt Universal Saddle Type, 1943
No. HS Libby Universal Saddle Type, 1939
No. 5W Acme Universal Way Type, 1942
No. 5 Gisholt Universal Ram Type, 1942
No. 3 Gisholt Universal Ram Type, 1942
No. 4R Libby Universal Ram Type, 1942
No. 6R Denver Universal Ram Type, 1942
No. 3R Libby Universal Ram Type, 1942

MILLS
No. 3 Van Norman Plain, 1942
No. 1224 Milwaukee Simplex, 1943
No. 1-18 Cincinnati Auto, 1941
No. M-18 Milwaukee Auto, 1943
No. 2 Alora Plain Mill, New
No. 2 Baimp Universal Mill, New
No. 2 Baimp Vertical Mill, New

MISCELLANEOUS
2000 HP Midwest Dynamometer, 1942
75 HP Gardner Denver Air Compressor, 1945

PLANERS AND SHAPERS
14" Brook Plain Shaper, New
18" Brook Plain Shaper, New
16" Gornetti Universal Shaper, New
20" Gornetti Universal Shaper, New
24" Gornetti Universal Shaper, PRT, New

PRESSES
650 Ton Verson Double Action Eccentric, 1940

Partial Listing — Write for latest stock list

INDIANAPOLIS *Machinery & Supply Co.*
1961 S. Meridian St. • • Indianapolis, Indiana

MUST MOVE PROMPTLY FROM LOCAL CUSTOMER'S PLANT

BEMENT MILES 18" SLOTTER with 3" dia. spindle. M.D.

GOULD & EBERHARD 36" Gear Cutter M.D.

BROWN & SHARPE #5—48" Gear Cutter, M.D.

BINSEE MACHINERY COMPANY HORIZONTAL BORING MILL. Table 30"x64". Quantity of boring bars.

GRAY 36"x36"x8' Planer, 2 heads on cross rail; motor driven. Thoroughly rebuilt and guaranteed.

B & O #2 Turret Lathe 1" Cap. M.D.

FOOTE-BURT #25—24" Heavy duty Vert. Drill #5 M.T. Motorized.

GRINDERS—CYLINDRICAL. B & S #11, 7"x 32". Plain Grinder. Table swivels. Motorized with 4 motors.

LANDIS 10"x36" Plain, M.D. Also Planer type Grinder 16"x36".

"BEMENT" 26" STROKE TRAVERSING HEAD SHAPER. 48" travel to ram. 2 tables. (PLANER SHAPER)

WE HAVE A LARGE STOCK FROM WHICH TO SELECT. TELL US WHAT YOU WANT.

THE OSBORNE & SEXTON MACHINERY CO.
P. O. Box 88 Columbus 16, Ohio

1941-1952 MACHINE TOOLS

IMMEDIATE DELIVERY — NO PRIORITIES NEEDED

CAM MILLERS

VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

CUTTER & TOOL GRINDERS

FELLOWS: Flat Top Helical Gear Cutter Grinder
OLIVER: 10" Template Tool Bit
RANSOM: 2-Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New), automatic indexing

DRILLING MACHINES

ALLEN: #2 High Speed, 15" overhang
CINCINNATI-BICKFORD: 1¼" upright
PRATT & WHITNEY: ½B x 50 Deep Hole Reaming Machine

GEAR CUTTING MACHINES

BROWN & SHARPE: No. 6 Gear Cutter, 72" diameter, 1⅝ D. P. capacity
CLEVELAND: Model 130 Gear Hobber (like new)
CLEVELAND: Model 140 Gear Hobber (like new)
FELLOWS: 61A Shaper, 18" dia.
FELLOWS: 64A Shaper, 18" dia.
FELLOWS: 72 Shaper, 7" dia.
FELLOWS: Flat Top Helical Gear Cutter Grinder
FELLOWS: Straight Line Generator, 3" dia. with many cutters
GLEASON: #12 Rough & Finish Gen.
GLEASON: 3" Straight Bevel Gear
GOULD & EBERHARDT 96", Universal, motor-driven
SYKES: Gear Shaper 14" external, 20" internal (New)
SYKES: Rack Cutting Machine 12" to 36" length capacity (New)

GEAR AND SPLINE GRINDERS

PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
GEAR GRIND MACH: GG-19, 10"x 24" Hydr. Spur Gears and Splines

GEAR FINISHERS & TESTERS

FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical
FELLOWS: #12C Cone & Spacing Inspection Instrument
GLEASON: No. 4 and No. 6 Bevel Gear Testers, Hand and Power
NATIONAL BROACH: SIC-12" Red Ring Gear Testing Machine

GRINDERS—CYLINDRICAL

BROWN & SHARPE: No. 10 capacity 6"x18" plain
CINCINNATI, 6"x18" Hydraulic, Plain
LANDIS: 16x32" Type "D" Crankpin, hydraulic, for grinding crankshafts
LIDKOPING: Centerless (New)
NORTON: 10"x36" plain, hydraulic
NORTON: 10"x18" 45° angle wheel

GRINDERS—GEAR & SPLINE

GEAR GRIND MACH.: GG-19, 10"x 24" Hydr. Spur Gears and Splines
PRATT & WHITNEY: 10" single and double wheel, hydraulic feed

GRINDERS—INTERNAL

BRYANT: No. 5Y Internal
BRYANT: 16C16 Hole, Hydraulic
HEALD: 72A3 Sizematic Centerless

GRINDERS—RADIUS

VAN NORMAN: #73, capacity 7½"
VAN NORMAN: #639, capacity 7"
VAN NORMAN: #649, capacity 6" to 16" diameter
VAN NORMAN: #3½ Un. Radius

GRINDERS—SURFACE

ARTER: A-1—8" Rotary
HEALD: 8" Rotary
HEALD: No. 22 Rotary—12" Chuck

GRINDERS—THREAD

EXCELLO: #31 External, dia. 5"x18"
JONES & LAMSON: #636 Universal, 6" dia. x 36" centers

HONING MACHINES

BARNES: No. 306H Vertical 24" Stroke
MICROMATIC: H-510 Double End Horizontal, ⅜" to 2" dia.
MICROMATIC: H-2 Single End Horizontal, 2-spindle, ¼" to 1" dia.

JIG BORING MACHINES

PRATT & WHITNEY #1 Jig Borer
SWISS #5B Jig Borer
LINDNER #14 & #15 Jig Borer, new

LAPPING MACHINES

FELLOWS: 8LSI and 13 LSI Gear Lappers, external and internal spur and helical
NORTON: 2Fx40" dia., for flat work
NORTON: No. 26 Hyprolaps, for flat work & Cylindrical lapping.

LATHES PRODUCTION

BLOUNT: Polishing speed lathe 12" dia. x 48" centers
REINECKER Relieving Lathe (new)
H.E.B.: High production hydraulic duplicating and copying lathes (new)
LE BLOND: Regal, 15" swing x 42" centers
LODGE & SHIPLEY: #3A Duomatic, 25½" swing x 27" centers
MONOMATIC 14"x48" Copying Lathe, with air tracer
30"x23' Centers, latest type, new engine lathe
POTTER & JOHNSTON: #6 DREL Automatic
PROGRESS: Geared head 16" to 30" swing (New)
TRIPLEX: 14" dia. x 40" centers Toolroom Lathes (new)
VDF New Engine Lathe 49" swing x 20' centers
VDF New Engine Lathe 27" swing x 23' centers

LATHES—TURRET

SCHIESS: 41", 65" and 79" Vertical Turret Lathes (New)
WARNER & SWASEY 2A Turret Lathe
WARNER & SWASEY #3 Turret Lathe
BULLARD: 64" & 84" Vertical Turret Lathe
HERBERT: #2, #4, and #8 Sizes (new)
WEBSTER & BENNETT: Vertical Turret Lathes 36" & 48" (New)

MILLING MACHINES

CINCINNATI: 2-spindle Vertical Hydrotel with two rotary tables of 36" dia.
TAYLOR-FENN: M-80 Duplex Spline
RICE-BARTON: Duplex Spline
VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work.

PRESSES

Gen. FLEX: Screw Press, 3 ton
LOGAN: 5-Ton Vertical Hydraulic Press
5-TON Vertical Hydaulic Press

SAWS & CUT-OFF MACHINES

CAMPBELL: No. 425 Cutalator Abrasive Cut-Off, 4½" dia. capacity
MOTCH & MERRYWEATHER: No. 3 Circular Saw with auto. stock feed
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
RUSSELL: 5½" dia. cut-off saws, auto stock feed, hydraulic (New)

SHAPERS

HERCULES: 16" & 22" Shapers (New)
KLOPP: 16" to 26½" Shapers (New)

THREAD MILLERS & TAPPERS

HALL PLANETARY: Model "D" Thread Miller
LANDIS: 2½" single head horiz. threading machine
LEES-BRADNER: 40A Thread Miller
MURCHEY: #22 Horizontal threading and tapping machine, ½" to 2½" dia. capacity, single spindle
NATCO: Vertical Tapper 16 spindle

WIRE FORMING MACHINES

BAIRD: 4-slide wire former.
HEENAN & FROUDE: Wire forming, 4-slide machines (new)

MISCELLANEOUS

CUTOFF: Campbell, abrasive 425 Cutalator 4½" dia. Capacity
RACK CUTTING MACHINE: Sykes 12" to 36" length capacity (New)
CUT-OFF: Russell 5½ & 9½" cut-off saws with auto. stock feed (new) hydraulic
PRESS: Screw, Gen. Flex. 3 ton
TEST STAND: Denison 918-AM Hyd.
LATHES: Blount Polishing Speed Lathe, 12" dia. x 48" centers
GOGAN BRINELL Hardness Tester Model 16-J
SHAPERS: Klopp 16 to 26½" (New)
SHAPERS: Hercules 16" & 22" (New)
SUNDSTRAND: 44" Double End Centering Machine
WIRE FORMING MACHINES: 4-slides (new)

INSPECTION INVITED — Telephone HAnover 2-4520

TRIPLEX MACHINE TOOL CORP.

75A West Street, New York 6, New York **Cable Address TRIMACTOOL**

MACHINE TOOL ENGINEERS SINCE 1919

HARVEY GOLDMAN PRESENTS

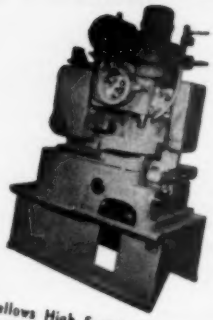
This Trade Mark Stands For:

- THE FINEST MACHINE TOOLS
- 3 GENERATIONS OF EXPERIENCE
- GUARANTEED SATISFACTION

CONSULT US WHEN YOU WANT THE BEST!

- AUTOMATICS
- BROACHES
- DRILLS
- GRINDERS
- LATHES
- MILLS
- PLANERS
- PRESSES
- SHAPERS
- MISCELLANEOUS

FOR IMMEDIATE DELIVERY



Type 27 Fellows High Speed Gear Shaper suitable for both spur and helical internal and external gears.

Reconditioned, fully guaranteed.

Available for immediate delivery.

HARVEY GOLDMAN & CO.

3910 SCHAEFER HIGHWAY • DEARBORN, MICHIGAN

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THE FOCAL POINT FOR PRODUCTION MACHINERY

FAIR DEALING PRICES FROM FAIRFIELD

A DEALER OF ESTABLISHED REPUTATION

Three Unusual Tools — All Late

6" x 48" Thompson Hydraulic Broach Grinder.

Cleveland 6 Spindle Automatic Chucker, 4¾" capacity.

Leland-Gifford 2LMS 6 Spindle Drill Press with back gears and power feed to all spindles.

FAIRFIELD EQUIPMENT Company DEALERS IN USED REBUILT & NEW MACHINERY

75 SANFORD STREET at R.R. Station Phone FAIRFIELD 9-3321 FAIRFIELD, CONN.

NEW
JUST ARRIVED
In stock N.Y.C.

7' Vertical Boring Mill (Italian)
American Calibrations
Max. Diam. will turn—82½"
Table Diameter—72"
Distance Tools to Table—48"
Speeds Table 16 (1.75-54 R.P.M.)
2 heads on rail (swivel)
1 side head
Motors 35 HP, 8 HP—two 3 HP 3/60/220-440
Weight—66,000 lbs.
6 months guarantee. Photo on request.

KINGS COUNTY MACHINERY EXCHANGE
408 Atlantic Ave., Brooklyn 17, N.Y.
TRiangle 5-5237

IMMEDIATE DELIVERY

BLISS No. 55 Double Action Toggle Draw Press, Bed Area 38" x 33", Stroke of Blankholder 10", Stroke of Plungor 21", Air Clutch. New in 1945.
BLISS No. 88 Straight Side Single Crank Press, Bed Area 30" x 29", 18" Stroke of Slide, Marquette Air Cushion, 255 ton Capacity.
TOLEDO Double Cranks, Nos. 91-42, 92C, 93½C, 93½E.
CLEVELAND Double Cranks 65-G-72, 45-D-60.
NIAGARA Double Cranks, 67C, 68C, 612C.
BLISS No. 25K Knuckle Joint 600 Ton Capacity.

NATIONAL MACHINERY EXCHANGE
128 Mott St. New York, N. Y.
Canal 6-2470

BRYANT
Internal Grinding & Facing Machine 16 A 22
Cam Grinding attachment,
3 motors—coolant pump—
Serial 3289—weight lbs. 8700
Immediate delivery from stock

MACHINE & TOOL CO.
29-28 41st Ave. Long Island City 1, N.Y.

1⅜" CLEVELAND Model "A" Automatic
Screw Machine. Like New.

WINSTON MACHINERY CO., INC.
326 West Ohio St. Indianapolis 2, Ind.

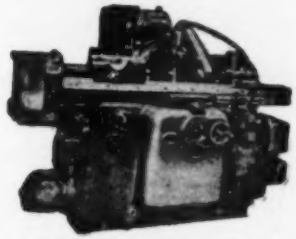
BORING MILL
Defiance Model 25-A 1940
table 38"x54"
3½" dia. bar, 23" feed
60" vertical travel
108" bed length
84" table cross feed
74 feeds .0016 to .490 per. rev.
20 spdl. speeds 12 to 1000 R.P.M.

FS-5927, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

NEW and LATEST TYPE REBUILT MACHINE TOOLS FOR SALE or LEASE

LATHES

MONARCH Model EE 19"x20" Toolroom
MONARCH Model N G.H. Engine Lathe 33½"x120" oc
LODGE & SHIPLEY G.H. Engine Lathe 24"-27"x16' oc
AMERICAN G.H. Engine Lathe 24"-27"x96" oc
AXELSON G.H. 24-Sp. Engine Lathe 18"x54" oc
LEHMANN G.H. 16-Sp. Engine Lathe 18"-20"x82" oc
AMERICAN G.H. Engine Lathe 10"-18½"x30" oc
MONARCH Model ST Multi-Tool Mfg. Lathe 12"x18" oc
HARDINGE 2nd Operation Lathe 1" Cap.



JONES & LAMSON MODEL TG 12 x 45"
AUTOMATIC THREAD GRINDER

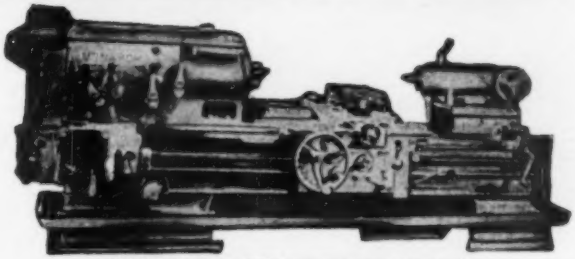
TURRET LATHES

WARNER & SWASEY Mod. 2 G.H. Ram Type 1" Cap.
WARNER & SWASEY Mod 2 G.H. Ram Type 1⅛" Cap.
GARDONS & OLIVER Mod 2 G.H. Ram Type 1" Cap.
GARDONS & OLIVER Mod 3 G.H. Ram Type 1⅛" Cap.
WARNER & SWASEY Mod 3 G.H. Ram Type 1⅛ Cap.
GISHOLT Mod 2 G.H. Ram Type 1⅛" Cap.
WARNER & SWASEY Mod 5 G.H. Ram Type 2⅛" Cap.
GISHOLT Mod 5 G.H. Ram Type 2⅛" Cap.
FOSTER Mod 1B Univ. G.H. Saddle Type 2-9 1/16" Cap.

GRINDERS

BROWN & SHARPE Model 2 Internal-External Universal Grinder 14"x30" Cap.
CINCINNATI Univ. Hydr. Cyl. Int.-Ext. Grinder 12"x 36" Cap.
ROTOREX Model 101-A Universal T & C Grinder, w/Int. Att.
COVEL Model 91A Univ. T & C Grinder
JONES & LAMSON Model TG-12x45" Auto. Thread Grinder
EXCELLO Model 35 Thread Grinder
EXCELLO Model 51 Thread Grinder

CINCINNATI 12" x 36" HYDRAULIC UNIVERSAL GRINDING MACHINE INT. EXT.



MONARCH 33½" x 120" ENGINE LATHE—MODEL N

LAPPING MACHINES

ULTRALAP Model 10 Vert. Lapper

TAPPING MACHINES

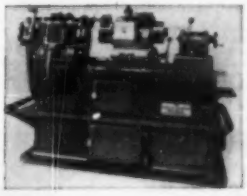
BAKEWELL Model 2 Tapper ⅜"—2½" Cap.

MILLING MACHINES (Horizontal)

VAN NORMAN Model 26 Ram Type Duplex
NEW CENTEC Model 2A Universal With Vert. Att.
MILWAUKEE No. 1-B Universal Miller
BROWN & SHARPE Mod 10 Auto. Production Miller
CINCINNATI Mod 6B Plain Horiz. Auto., Cycle

MILLING MACHINES (Thread)

PRATT & WHITNEY Model C-M-100a Thread Miller 4½"x30"
HANSON & WHITNEY Univ. Semi-Auto. Thread Miller 10"x48"



HANSON & WHITNEY UNIVERSAL SEMI-AUTOMATIC THREAD MILLING MACHINE 10" x 48"

MISCELLANEOUS

FAMCO #5, 8, 10, 12, 15 Foot Presses (NEW)
EXCELSIOR #5, 8, 10, 12, 15 Foot Presses (NEW)
ARBOR PRESSES (NEW)

VERTICAL MILLER

GORTON Model 6D Super Speed Vertical Miller

PRESSES

WIEDEMANN Model R11P 18 Sta. Power Turret Punch
RUESCH #2 Pneumatic Press
POWER PRESSES (New)

AUTOMATICS

BROWN & SHARPE Model 00G ⅝" Cap.
CLEVELAND Model A Single Spindle 8/16" Cap.
CLEVELAND Model A Single Spindle 1-1/16" Cap.
CLEVELAND Model A 1¼" Cap.
CLEVELAND Model B Single Spindle 1½"—18" Cap.

BORE-MATICS

EXCELLO Model 2112A Single End Double Spindle Hyd. Cross Slide Table

DRILLS

NEW D. M. & B. Type T.D. 3 Radial 4'x12' Column
NEW ZEWO Universal Floor Type Radial 21"x6'
NEW CANEDY OTTO 18" Single Spindle ¾" Cap.
NEW FAMCO 15" Bench Type Drill Presses ½" Cap.
NEW FAMCO 15" Floor Type Drill Presses ½" Cap.
MORRIS MOR-SPEED RADIAL 2'x8' Column
LELAND GIFFORD 2 Spindle

GEAR EQUIPMENT

BARBER-COLMAN Type 8 Gear Hobber
FELLOWS 8" Fine Pitch Shaper
GLEASON 12" Straight Bevel Generator—Finisher-Roughor
GLEASON 3" Straight Bevel Generator
GLEASON 3" Spiral Bevel Gear Generator
GLEASON 3" Bevel Gear Tester
GLEASON Model 8 Angular Hypoid Tester
GLEASON 19" Spiral Bevel Generator
BARBER-COLMAN Model 12 Hobber 12" Cap.

PROFILERS

PRATT & WHITNEY 40-Inch Profiler 2 Slide Heads
PRATT & WHITNEY 30" Single Spindle

SHAPERS

HENDEY Universal H.S. Crank Shaper 12"
GOULD & EBERHARDT Industrial Shaper 36"

SHEARS

COLUMBIA 92"x¼" Cap. 18" Gap Power Shear
PEXTO 44" Geared Power Gap Shear
NIAGARA Model 412 Power Shear 12'x16 Gauge

NIAGARA #412 POWER SQUARING SHEAR 12' x 16 GAUGE

MACHINERY RENTALS, INC.

197-199 MOTT STREET NEW YORK 12, N.Y.
PHONE: WORTH 4-7615

UNUSUAL BUYS WITH GUARANTEED PERFORMANCE

PARTIAL LIST OF LATHES

Lodge & Shipley 14"x5' G.H., single pulley drive. 12 spindle speeds, 20" centers.
American 20"x14' American G.H. Lathe, complete with taper attachment.
American 20"x60" bed, Internal Face Plate Drive, 33" centers, 2⅝" hole in spindle.
American 24"x12' bed 3 SCD, motorized.
Lodge & Shipley 10"x120" centers G.H., Timken bearing, drop lever handles in apron, late type.
Bradford 30"x18' bed, 4 SCD, 12' centers.
Lodge & Shipley 29"x6' bed, single pulley.
LeBlond 17"x8' bed 3 SCD
American 16"x8' bed, 3 SCD, bowl head
Lodge & Shipley 16"x6', single pulley
LeBlond 15"x6' G.H., 9 spindle speeds
Lodge & Shipley 14"x6', 3 SCD
American 14"x6', 3 SCD bowl head.
American 20"x12', 3 SCD Lathe, 6' centers.
LeBlond 27"x16', 3 SCD Lathe, 9'11" centers.
American 24"x18' Lathe, vee-belt drive, 13' centers, 12 spindle speeds.
Boye & Emmes 20"x10', G.H., complete with taper attachment.

TURRET LATHES

Gisholt 1-L Saddle-Type Turret Lathe, with bar feed, late type.
Oster 80 Rapidproduction.
Warner & Swasey 2A, single pulley drive.

BORING MILLS—Vertical

Niles 36"-44", 1 rail and 1 side head.
Niles 42"-52" Driving Box Borer, Burnisher and Facer, motor driven, late type.
King 42", motorized, 2 heads on rail.
42-56 Niles Vertical Boring Mill, one rail and one side head, late.

GEAR MACHINERY

Gould & Eberhardt 10-N Hobber.
Gould & Eberhardt 9SH Gear Hobber.
Gould & Eberhardt 60BW Gear Roughers.
Fellows 012 Spur Gear Shaper.
Fellows 72S Gear Shaper, with spur guide.

GRINDERS—Cutter & Tool

Oliver Template Tool Bit Grinder, late.
Sellers 4T Tool Grinder, late type.
Sellers 6T Tool Grinder, late type.

GRINDERS—Internal

Heald 78 Centerless, Internal & Cylindrical, late type.
Heald #50, tight & loose pulley.
Heald #79A, new 1941.
Heald 72A3 Plain Internal Grinder, late type.

GRINDERS—Cylindrical

Landis 10x19 Type C Plain, late type.
Landis 26"x168" centers Plain, arranged for motor drive with motors, 10 speeds 3 to 62.
Landis #2 Universal, 12"x33" centers, belt drive.
Cincinnati #3 Universal, belt drive, 12x48.
Landis 10"x72" Plain Cylindrical.

GRINDERS—Thread

Jones & Lamson 8x3', late type.

MILLERS—Plain

Brown & Sharpe #3, 4 SCD.
Brown & Sharpe 4B Heavy, single pulley
Douglas #0, rectangular overarm.
Kempsmith #3, 4 Step cone drive, single back geared.

MILLERS—Universal

Cincinnati #4, single pulley drive, 16 speeds.
LeBlond 2½ Heavy Duty, 3 SCD, motorized.

MILLERS—Vertical

Cincinnati #3, Single pulley drive.

DRILLS—Radial

American 7'10" Triple Purpose, with DC motor on base, with plain table.
Cincinnati Bickford 4'11" column, gear box on base.
Fosdick 6'15" Heavy Duty Radial Drill.

PLANERS

Pond 48x48x16' Double Housing, DC drive, 4 heads.
Pond 42x42x16' Double Housing, DC drive, 4 heads.
Pond 84x84x16' Double Housing, DC drive, 4 heads.

SHAPERS

Smith & Mills 14" Plain Crank, Lima drive.
Gould & Eberhardt 20", B.G., gear box.
Averbeck 21" B.G., 4 SCD.
Potter & Johnson 24" Universal.
Gould & Eberhardt 24" B.G., gear box.
Smith & Mills 25" B.G., 4 SCD.
Columbia 28" B.G., gear box drive.
Gould & Eberhardt 28" B.G., gear box.
Gould & Eberhardt 32" B.G., gear box.
Smith & Mills 32" B.G., gear box drive.

MISCELLANEOUS MACHINERY

Fitchburg 48" Spline Grinder, late type.
Lincoln 200 Amp Arc Welder.
Pines Hydraulic Bender, 1½" capacity.
H&G Model 1-K Threading Machine, late.
Taft Pierce Bench Center, 0"x48" centers.
Hoffman Heavy Duty Portable Cleaner.
Model #22 Rodgers Hand Track Press.

GUARANTEED MACHINERY

Cincinnati Machinery Co., Inc.
219 East Second Street
Cincinnati 2, Ohio

BORING MILLS

No. 0 G&L Horizontal Boring, Drilling and Milling Machine
No. 32 LUCAS Horizontal Boring, Drilling and Milling Machines
36" BULLARD Vertical Turret Lathe
100" BETTS Vertical Boring Mill

DRILLS

3'9" CINCINNATI BICKFORD Hi Spd Radial, '41
32" CINCINNATI BICKFORD Upright Drill
No. E3 NATCO Mult. Spindle Drill—Hyd. table, '42
No. 425 BAKER D.S. Heavy Duty Drill
No. 2MS LELAND GIFFORD 4-spindle Drill

GEAR EQUIPMENT

Nos. 64, 72 & 72SA FELLOWS High Speed Gear Shapers
No. 12 FELLOWS Gear Shaver, 1941
No. 36BW GOULD & EBERHARDT Gear Roughers

GRINDERS

No. 5 B&S 3"x12" Plain Grinder
6"x18" CINCINNATI Plain Hyd. Cyl.—Filmatic
6"x18" LANDIS Type C Plain Grinder
6"x18" NORTON Vertical Spindle Surface Grinder
10"x24" LANDIS Universal Grinder
10"x72" LANDIS Type C Hyd. Pl. Grinder—'42
No. 104 RIVETT Internal-External Grinder
No. 73 HEALD Internal Centerless Grinders
No. 172 HEALD Internal Grinder

LATHES

14"x6' HENDEY Model ECM M.D. Engine Lathe
16"x30" LODGE & SHIPLEY Toolroom Lathe, '41
20"x10' LODGE & SHIPLEY Selective Geared Head
27"x14' oc LEBLOND HD Engine Lathe, '42
30"x16' bed AMERICAN "High Duty" Geared Hd.
36"x16' bed AMERICAN HD Lathe
42"x15' AMERICAN Geared Head Lathe
42"x25' oc AMERICAN "Super Productive" GH Lathe—two carriages

MILLERS

Nos. 0-8 CINCINNATI Plain & Vert. Milling Mach.
Nos. 1-8 & 1-14 KENT OWENS M.D. Production Millers
Model MM-5 U.S. Multi-Miller
No. 2 B&S Pl. Light Type Miller
No. 2M CINCINNATI Vertical Miller 1941
18" CINCINNATI Mfg. Knee Type Milling Mach.
4½x30" P&W Model C Thread Miller
36"x36"x10' INGERSOLL Planer Type, 3 heads
30"x36"x12' INGERSOLL Planer Type, 3 heads, Late

AUTO LATHES & TURRETS

No. 2 B&S Wire Feed Hand Screw Machine
No. 2 W&S Geared Friction Hd. Turret Lathe
No. 3A W & S Univ. Hyv. Dty. Saddle Type Thr. Lathe
No. 3 J&L Ram Type Universal Turret Lathe
No. 1H5 LIBBY Heavy Duty Turret Lathe
No. 1L GISHOLT Saddle Type Turret Lathe, 1942
Nos. 4D & 6S POTTER & JOHNSTON Auto.

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Cincinnati #2 Centerless Grinder, Simatic, 1943
Reed model A2I Thread Roller, 1944
Heald #48A single and borematic, 1942
Cincinnati-Bickford Radial Drills 9' Column, 1942

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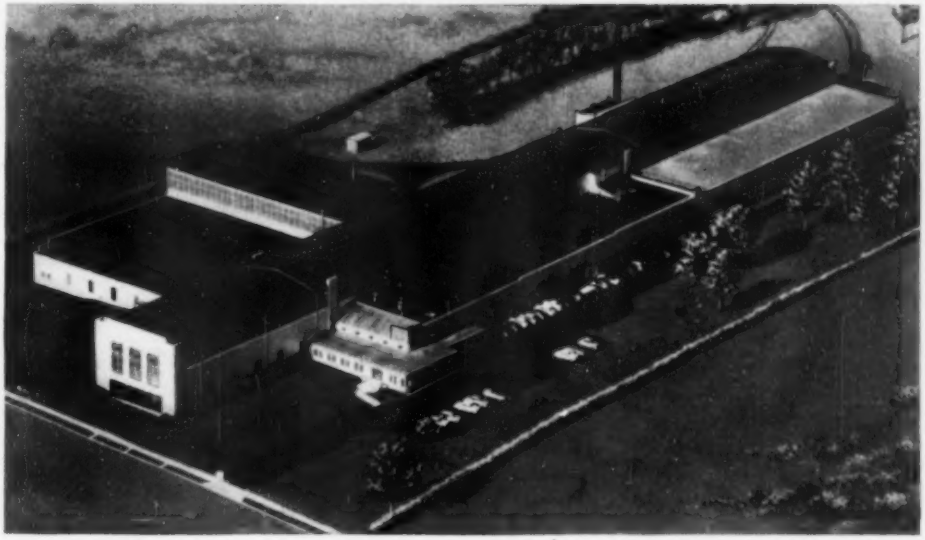

ARBOR PRESSES

No. 37E Wilson Hydraulic, hand operated, 50 tons, new
No. 3 Greenerd Arbor Press, floor type, hand operated

AUTOMATICS

4 spindle 1¼" Conomatic, m.d., bar, 1942 machine
No. 5D Potter & Johnston, m.d.
No. 6A Potter & Johnston, m.d.
No. 6C Potter & Johnston, m.d.
14" Fay Flanders Type, m.d.
4 spindle 2¼" Cleveland Model A, m.d.
No. 8A Cleveland, m.d., 8" cap., latest

BOLT THREADERS

Victor Nut Facing Machine, m.d., cap. ⅝" to 2" nuts
1" Landis Double Spindle, m.d. thru gear box
1½" Landis 2 spindle, late
1½" Landis 2 spindle, older type

HORIZONTAL BORING MILLS

#31 Lucas, m.d.
Barrett Double End, 5" and 7" spindles, m.d.
3½" bar Landis Floor Type, m.d.
4½" bar Niles Table Type, m.d.
5½" bar Niles, m.d.
10" bar Bellers Floor Type, m.d.
Pair tables for use on Floor Type Horiz. Boring Mill, 8'9" long x 12½" wide x 38" high, 2 T slots
Pair tables for use on Floor Type Horiz. Boring Mill, 8' long x 15½" wide x 33" high, 2 T slots
Floor Plate consisting of box type Planer Table, 21' long x 48" wide, 12" thick
51"x11' Rectangular Table, 40" high

VERTICAL BORING MILLS

24" Bullard New Era, m.d.
36" Bullard New Era, m.d.
42" Bullard Spiral Drive, m.d.
42" Bullard New Era, m.d.
42" King, m.d.
48" Colburn, m.d., 2 swivel heads
100" Niles Heavy, m.d., p.r.t.

BROACHING MACHINES

75 H.P. LaPointe Hydraulic Broach, m.d.
Cincinnati Mill Broach, m.d., 10" spindles, new
12x72" Thompson Automatic Flat Broach, m.d.

RADIAL DRILLS

4' Carlton, 11" col. dia.
4'-13" col. Cincinnati-Bickford Plain, m.d.
8'-17" col. Drosen, gear box, m.d.
Zeus Precision Universal Bench Type Radials, m.d., new

BALL BEARING DRILLS

No. 15 Buffalo, bench model, m.d.
No. 15 Buffalo, floor model, m.d.
No. 18D Buffalo, floor model, m.d.
No. 18 Cassedy Otto, bench model, m.d.
Allen Bench Type, m.d., ½ H.P., 12" overhang
Mason Bench Type, Single Spindle, belt
Providence Engineering Co., Model E, s.p.d.
No. ½, 1, 2 Avey, belted m.d.
No. 1B Edlund, m.d., new
No. 4 Fondrk, 8" overhang, belted m.d., No. 2 Taper
2 spindle Allen, belted m.d., 8" overhang
2 spindle Avey, size No. 1 Type B, style VHP, m.d., 8" overhang
2 spindle Avey No. 3, belted m.d., p.f.
2 spindle Leland & Gifford High Speed, 8" overhang, m.d.
#1LMB—3 spindle Leland & Gifford High Speed, late, m.d.
4 spindle Avey #1 High Speed, m.d., 7½" overhang, No. 2 M.T.
4 spindle No. 3 Avey, belted m.d., No. 3 Taper, 12" overhang
6 spindle Leland & Gifford No. 2 Taper, m.d. on each spindle
6 spindle No. 2B Edlund, m.d., No. 2 Taper
6 spindle No. 3 Avey, belted m.d.
6 spindle Henry & Wright, m.d., 15" overhang, No. 2 Taper

HORIZONTAL DRILLS

Natco 1 spindle Horizontal Hydraulic Hole Unit, m.d.
3 way Natco Horizontal Drill, consisting of 3 E11 Hole Units
No. ⅞Bx30" Pratt & Whitney 2 spindle Deep Hole Reaming Machine, m.d.
No. ⅛Bx30" Pratt & Whitney Gun Barrel Rifling Machine, m.d., latest
No. 1Bx74" Pratt & Whitney 2 spindle Deep Hole Reaming Machine, m.d., latest
No. 1½x105" Pratt & Whitney 2 spindle Deep Hole Drill, m.d., latest
No. 1½x100" Pratt & Whitney 2 spindle Gun Barrel Rifling Machine, m.d.
No. 1 Pratt & Whitney 2 spindle Deep Hole Drill, belted m.d.
No. 1½ Pratt & Whitney 2 spindle, m.d., older type
Special Horizontal Drill Machine, Cinti. Bickford Head mounted horiz. on base

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No. 3 Brown & Sharpe Universal, cone
No. 3A Brown & Sharpe Universal
No. 4 Cincinnati High Power Universal
No. 4B Heavy Brown & Sharpe Plain
48" Cincinnati Plain Automatic

LATHES

12"x84" centers American 12-speed Grd. Hd., taper
14"x30" ctrs Lodge & Shipley Selec. Grd. Hd.
16"x30" ctrs Lodge & Shipley Selec. Grd. Hd.
21"x136" ctrs. LeBlond Hvy. Dty., Turner Drive, taper
24"x60" ctrs American Hvy. Dut., 12-speed Grd. Hd., taper
36"x96" centers Boye & Emmes, cone, taper
36"x120" centers American 12-speed Grd. Hd., taper
36"x144" ctrs American 12-speed Grd. Hd., taper

PLANERS

24"x24"x6' Gray, A.C. M.D.
30"x30"x8' Cincinnati, a.c. m.d.
36"x36"x10' Cincinnati, a.c. m.d.
42"x42"x16' Gray
42"x42"x14' Niles-Bement-Pond Hvy. Pat., box table, 4 heads
48"x48"x12' Niles-Bement-Pond, 4 heads

GRINDERS

20"x144" Landis Plain Self-cont., arr. m.d.
10"x24" Landis Plain Self-cont., m.d.
10"x18" Norton Plain, m.d.
No. 49—53" Besly Vert. Spdle. Surface, m.d.
No. 2 Norton Motor Driven Universal Tool & Cutter No. 33 Abrasive Surface, m.d.

GEAR MACHINERY

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No. 2 Barber-Colman Hobber, m.d.
No. 5A Cincinnati 60"x16" Cutter
No. 12 Barber-Colman Hobber, m.d.
No. 18MM Gould & Eberhardt Double Spindle Hobber, s.p.d.
No. 18-H Gould & Eberhardt Hobber, a.c. m.d.
6", 11" & 18" Gleason Bevel Gear Generators
18" Gleason Bevel Gear Tester
No. 7 Fellows High Speed Shaper, m.d.
12" Gleason Bevel Gear Planer, cone

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6'-15" col. Cincinnati-Bickford, m.d.
6'-16" col. American "Triple Purpose", m.d.
7'-17" col. Drees, m.d.

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No. A4 Robinson O.B.I., m.d., 56-tons
No. 77 Toledo Open Back, b.d.
No. 5H Cleveland Morning, arr. m.d.

MISCELLANEOUS

58" Colburn Vert. Boring Mill, a.c. m.d., p.r.t.
D-2 Colburn Heavy Duty Drill
1⅞" Conc 4-spindle Automatic, bar feed
7"x7" Peerless "Mechani-Cut" Hack Saw, late
10" Dill Slotter, m.d.
20", 24", 28" Gould & Eberhardt Shapers
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1½" Landis 2-spdl. Bolt Thrd., m.d.
2½" Landis Long Bed Stay Bolt Threader, cone, leadscrew

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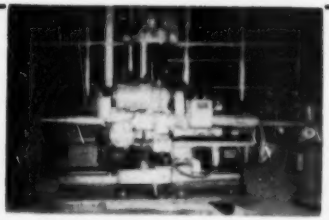

KEYSTONE—UNIVERSAL MODEL 143-2, SERIAL #6917

Planton Type—Horizontal travel of column—54"
Spindle—3" dia.—30" travel #5 M.T. Ball Bearing
Vertical Travel—32"
Column—12" Dia.
360° swivel of head horizontally
180° swivel of head vertically

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1—Fellows Gear Shaper Model 81 ser. #26359 complete. 35" capacity. (1947)
1—Fellows Gear Shaper Model 81-A ser. #22198 18" capacity. (1943)
2—Axelson 25"x48" engine lathes Taper att. thrd. etc. (1948)
1—Axelson 20"x120" engine lathe. MD rapid trav. chuck etc. (1948)
1—B&O saddle type turret lathes Model #22-B 4½" bar cap. hyd. bar feed, chuck, tooling etc. (1947)
1—Bardons & Oliver saddle type turret lathe Model 21-B, 3" bar cap. hyd. bar feed, chuck, rap. trav. tooling etc. (1947)
1—Jones & Lamson Model TG 615 Thread Grinder, automatic 1944
1—10 ton Shaw-Box fish belly, cab operated crane
1—Roller leveller, McKay, 17 roll 4" dia. 58" wide by 14 to 30 gauge
1—Stamco sheet corrugator for sheets 12' long 14 to 30 gauge

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Ingersoll Adjustable Rail Planer Type Milling Machine—Serial #5158.
#84 Fellows Gear Shaper, Ser. #28115
#84A Fellows Gear Shaper, Ser. #25634
6 American Radial Drill, Ser. #55592
60" Mansbett Face Grinder
6D Potter & Johnston Automatic Chucking Machine
16" Gould & Eberhardt Shaper, Ser. #867A7
Cincinnati #3 Miller—Ser. A1604-B
Gonrud Pin Router, Serial #2525
20" Knight Rotary table—Motor Driven

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40"x12' cc Pittsburgh Engine Lathe
#51 Niagara SS Single Crank Press, MD, 3" St.
#1648 Consolidated SS Double Crank, MD, 5" St.
#1120 Niagara 10'x16 ga. Shear, MD
#6 W&S Turret Lathe—Gear 130v, MD
20" Foote-Burt SS Drill—#4 MT, Gear Box
#3 Besley Double End Disc Grinder—Blower, MD
20'x96" cc LeBlond Heavy Duty Engine Lathe, MD
20"x48" cc LeBlond Heavy Duty Eng.ne Lathe

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Bullard 24" V.T.L., Spiral Drive
Cleveland 2½" Bar Capacity
Giddings & Lewis No. 32, 3" Capacity
King 42", 72" Vertical 2 rail heads
Niles-Bement-Pond 4", 4½" Bar, 60" Vert.
Niles-Bement-Pond 60" Vertical
New 3" Horizontal Boring Mills

DRILLS AND RADIALS

Brand New Radials
American 6'x15" Universal
Baker No. 321 Vertical Boring & Drill
Bausch Multi-spindle
Buffalo #2 Motor Spindle, No. 16 4 Spindle
Buffalo: Power No. 41, No. 42
Canady-Otto 21" Sliding head New
Cincinnati Bickford 6'x15" col.
Natco #12 20 spindle drill
24" Sibley Sliding head
New Geared Box Col. Drills 24'
Foote-Burt #25 3" capacity
Leland Gifford 2 LM5, 3 MS

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Deckel type 3 Dimensional, New
Gorton 3S Die Sinker & Engraving
Gorton 3Z with copy plate, 3U
Gorton #1A, ME
Preis—UE3—2 dimensional
Taylor-Hobson 3 dimensional Pantograph

GEAR EQUIPMENT

Barber-Colman Mod. SHS. Sharpener
Barber-Colman #2, #12 (3)
Fellows High Speed Shapers 712, 725, 71
Fellows #20M Redliner
Flather 72" Cutter
Gleason #2 Surface Hardener
Gleason No. 3 Bevel Generator
Gould & Eberhardt 36" Cutter
Michigan Gear Finisher 24" cap., 862-24A
National Broach Red Ring Lapper, Finisher
Schuchardt & Shutte #1 Hobber

GRINDERS, MISCELLANEOUS

Bryant #5, Internal, chucking, 16A16
Cincinnati 6x18" Hyd. #4—Centerless
Cranby Models 1G1 & 1G2—Internal
Garton Ped. Type Tool Grinder
Heald #73 Internal Centerless, Sizematic
Heald #81 Internal Gagematic
Heald 72A3 Int. Centerless Sizematic
Landis 6"x30" Type C Cyl., 10x24 Univ.
Norton No. 2, Tool & Cutter
Norton Type C 6"x18" Semi-Automatic cyl.
Norton 6"x30", 10"x18" Type C cyl.
Norton 14"x96" cyl., 16x48 Univ.
Norton Roll Grinder 50"x28'
Oliver #510 Drill Pointer
Pratt & Whitney Radius Model R6
Sellers 6T Tool, K.O. Lee tool
Van Norman #666 Crankshaft
Wicaco Internal

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Brown & Sharpe (4) Model 2G, serial No's. 8500 & 11500 series, 1¼" 1½" capacity.
Brown & Sharpe (10) Model 0G, serial No's. 9600 & 10700 series, ⅝" capacity.
Brown & Sharpe (6) Model 00G, serial No's. 14, 15, 1600 series, ¾" capacity.
Cleveland, Model AA-11, Serial #36586.
Cleveland, Model B, Serial #42618/843, 1x1/16" capacity.
Conomatic 4 Spindle, Serial 2309FF, 1½"
Conomatic 8 spindle, serial No. 3947VB 1⅛"
New Britain Gridley 61 6 Spindle, Serial No. 25410, 1⅛" capacity.

GRINDERS, SURFACE

New 8x24" Hyd. Feed, 10x18", 6x18"
Abrasive 8x24", #33 Vert. & #34
Bleachord #16, 26" Mag. Chuck
Heald 22—12" chuck, A/ter 12"
Norton 6x18" Hydraulic
Portman 12" Chuck Rotary
Pratt & Whitney 12x36" Vertical
Reid 11x36 Motor in Base, 2A 6x18
Taft Pierce #1 Precision

LATHES

American 14"x30
Bridgeford 36"x20', 32"x16'
Hendey 12"x42" and 12x30", 1941, 16x66"
Hendey 14" Yoke Head Lathes
LeBlond Regal 10"x3' bed, 19x42"
Lipe-Carbo 12"x18" (2)
Lodge & Shipley #3A, #3 Duomatics
Pratt & Whitney 16"x60—Late
New 16, 18, 20", 28", Immediate Del.
New Tool Makers 10x24"
Reid Small Piece #9WSL
Rivett Model 918 Precision, Mod. 715
Sebastian 12"x4' G.H., Sheldon 12"
Sundstrand 8x15", 15' Stub
Wickes 32"x35' Geared Head

MILLS, PLAIN, UNIV. PROD.

Brand New Universal Mills No. 1, No. 2
Archdale Plain, 14" Production
Brown & Sharpe #3B Plain, Late, 3A, 2I, #2L
Cinn. No. 3, 4 Plain Spd., 18" Manufacturing
Kent Owens 1V, 1-8, 1-14, 1M
Kempsmith #1 Pl., Vert. & Div. Hd.
Milwaukee 2K, 2H Univ., 2H Plain.
Milwaukee #2B, Plain & Univ.
Sundstrand #00, 0, Rigidmils
Sundstrand #3A Rigidmil with copying Attach, 33
Van Norman #2L Univ. Dividing Head

MILLS, VERTICAL

Brand New Vertical Mills
Cincinnati 2 Spindle Hydromatic
Cincinnati #3, #4 hi-power, 08 Vertical
Cleveland No. 1, table 8"x32"
Morey #12M Profiler, 2 sp.
Pratt & Whitney Profiler 12B, 2 sp.

PRESSES

Bliss No. 1 Double Action Drawing Press
Bliss 308—SS, Geared, bed 30x30" 255 Ton
Bliss 645, 650 Hi-Production Presses
Bliss 18, 19, 21, OBI, 58, 62, 162, OB
Bliss 4½ Double Action, Roll Feeds, Cam (2)
Bliss #78½, 330 Ton SS, Bliss 74½
Bliss S-48 Obl. 32x48" bed, Cushion
Hamilton 850 Ton S.S. Bed 27x48
Hamilton 110 FM Die Tryout Press
New 85, 60, 55, 30, 20, 15, 10, 5 Ton O.B.I.
Niagara Herning 15 Ton
Niagara A1¼ O.B.I.
Toledo 92½c Double Crank 43x23" bed
Toledo 29 Double Action Cam
V. & O. #102 O.B.I. Reducing
Walsh No. 3 O.B.I. 23 Ton, ☐ #3

TURRET LATHES

Acme 6W Fox 2-9/16" Cap. #2 Cross Slid. Turret
Bardons & Oliver #2, 3, 5, 7, Bar Feed
Brown & Sharpe, #2 Head, #10, 11
Denver 6 2" Shell Turret (2)
Foster #2B 2½" Cap. Morey #2G Late
Gisholt 2L, Cross Slid. Tur. #5 Bar Feed, Chuck
Gisholt Simplimatic, 18"x16½"
Gisholt 4R—9½" hole in spindle
Libby 1M5 with threading att.—3R, 4R
James & Lamson #5, Bar Feed
Morey #2G Late
Oster 601 WD. #2 Simmons Microspeed
Warner & Swasey #1A, Timken Head
Warner & Swasey #1, 2, #4 Preselector (2)

MISCELLANEOUS

Band Saw: DoAll, 16" Metalmaster
Bolt & Pipe Threader: Landis, Oster-Williams #915 Pipe & Nipple Threader
Boring Bar: Underwood 4"
Broach: 3L LaPointe Hydro. Horiz. New Klink, 6 Ton, Horizontal 11 Ton Vertical
Hacksaw: Peerless 6"x6", Racine 6"x6"
Hand Mill: Whitney
Hoist: 5 ton capacity 7½ HP motor
Honer: Micromatic H-4
Keyseater Davis, Baker
Oil Groover: WICACO
Planer: Niles-Bement-Pond 36x36'x10'
Rotary Table: Cincinnati, power take-off
Saw: Shaping 6x6", 13x13"
Shapers: 24" Rockford, 24", 28" Gould & Eberhardt, Cinn. 20, 24"
Shears Power: Obi 10' 3/16", 10"x 16 gauge Vertical Milling Att. New, Bridgefield
Tapper: Haskins—2CA
Welder 50 KVA Elsler Air Operated, New Seam.
Welder: Taylor-Winfield 50 KVA Hi-Wave

New Lathes 16" to 28", Mills, Boring Mills, Broaches, Shears & Presses

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8 and 9 oz. Injection Moulders
125 Ton Southwark Press, Bed 96"x30", 30" stroke, 2 to 4 ft. opening
150 Ton Triple Action HPM Press
250 Ton Watson & Stillman 28x24"
300 Ton Watson & Stillman 24x29"
300 Ton Watson Stillman 20"x20" Platen 8" St. 19" opening
800 Ton Williams & White 42"x60"

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Air Hydraulic Presses — Arbor Presses #6C Famco — Band Saws Kalamazoo — Famco 6x12"—Drill Presses all sizes—Hydraulic Press Northern 20 Ton — Injection Molders, 1 ounce — Power Presses, OBI, 1, 4, 4½, 5, 7½, 10, 15, 20, 30, 55, 85 ton—Shapers, 7", 8", 14", 18" Shaperite—Shears, Foot 22" to 8', 16 & 18 ga.—Shears Power 3'x18 gauge to 10' x 10 ga.—Welders Arc Seam Spot all sizes Motors, Grinders, Buffers.

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GEAR EQUIPMENT

BARBER COLMAN Model A Gear Hobber 1943.
FELLOWS 61A Gear Shapers 1941.
PRATT & WHITNEY 10" Hydraulic 2 wheel Gear Grinders (2) 1941.
GLEASON No. 12 Tool Sharpener 1944.

GRINDERS

MATTISON 12"x48" Surface. 1942.
HEALD 25A 16" Rotary Surface Grinder Automatic Chuck Feed. 1945.
CINCINNATI 10"x48" Plain Cylindrical Grinder, Servo infeed 1941.
CINCINNATI 10"x36" Plain Cylindrical Grinder, Servo infeed 1942.
HEALD 22 12" Rotary Surface Grinder 1941.

LATHES, ENGINE AND PRODUCTION

AMERICAN 27"x10' CC, Engine Lathe, 11" Hollow Spindle.
LEBLOND 13" Rapid Production 1200 RPM, 1945.
LODGE & SHIPLEY Model 3A Duomatic, 1946.
SENECA FALLS Model R-14 Low Swing Lathe 1942.
SUNDSTRAND 12A Automatic Lathe 36" Centers front and rear slide, air chuck and air tailstock, 1951.

LATHES—TURRET

GISHOLT 2L Preselector. Cross Sliding Turret, Bar and Chuck.
GISHOLT 1L Saddle Type 1944.
BARDONS AND OLIVER No. 2 Ram Type Turret Lathe 1942.

MILLS

CINCINNATI 4-48 Duplex 4 Spindles close coupled, extra column height, 1943.
CINCINNATI 1-18 Production Mill, 1943.

SHAPERS

GEMCO 20" Universal Power Down Feed, Power Rapid Traverse. 1946.
OHIO 36" Universal S.P.D.

MISCELLANEOUS

SOUTHWARK 20'x1" Pyramid Type Bending Roll Drop End Balance Bar.
No. 3 PLAN-O-MILL Thread Mill with extras 1945.
HEALD No. 1 Tool Sharpener 1942.

MacDell CORPORATION
1042 W. LAKE ST. • CHICAGO 7, ILL.

AUTOMATIC, 8006 B. & S., 1950
AUTOMATIC, 12¼" 4 spin. Gridley Model G
BOLT THREADER, 1½" Williams Reliance
BORING MILL, 100" N.B.P., 2 Hds., M.D.
BORING MILL, 100" Cinci. Massive, 2 Hds., M.D.
BORING MILL, 72" King, 2 Hds., P.R.T., M.D.
BORING MILL, 72" N.B.P., 2 Hds., P.R.T., M.D.
BORING MILL, 3½" bar Defiance, Table Type
BORING MILL, 3½" bar Giddings & Lewis 20
BORING MILL, 3" bar Lucas, Table Type
DRILLS, RADIAL, 4' Western, M.D. (2)
6' Amer. 15" col. Trip. Purp., M-on-Arm
5' Amer., 15" col. Trip. Purp., M-on-arm
5' Amer., 14" col., Trip. Purp.
5' Niles #10 Rightline, Univ., Motor-on-arm
4'11" col. Cinci. Bickford
1"B" & 2½" Arboga (Swedish), Late
TABLES, RADIAL, 36"x20"x20"
DRILLS, #8D Colburn 36", 5" capty.
#3½ Baker, 24", 3" capty.
24" Cinci. Bick., Tapping, M.D.
#2LMS Leland Gifford, Deep Hole
FLANGERS, ¾" and ½" McCabe (2)
GEAR BURNISHER, Model 8 Fellows
GEAR CUTTER, 60" Brown & Sharpe, #6 Spur
GEAR CUTTER, No. 12 B. & S. Spur & Bevel
GEAR SHAPERS, No. 7S Fellows
Nos. 6, 61A, 64 & 64A Fellows
11" Rienecker, Bevel
GRINDER, SURFACE, #16 Blanchard, 30" chuck
GRINDER, SURFACE, 14"x36" P. & W.
GRINDER, 4"x18" Landis 2-4H, Cylindrical, Late
GRINDER, No. 6T Sellers Tool, 1942
GRINDER, Micro Internal, large capty.
HAMMER, 1000 lb. Chambersburg Pneumatic, 1947
KEYSEATER, No. 3½, Baker, 24" str. x 4" wide
LATHES, 48"x20" cen. N.B.P., M.D.
48"x20" bed, Amer. T.A., Grd. Hd.
32"x14" bed Schumacher Boyd T.A., M.D.
28" 48"x16" bed Rahn Larmon, Geo
26"48"x24' bed McCabe Dble. Spin., M.D.
26"x12' Bridgeford, QCG, Grd. Hd., M.D. (2)
24"x12' bed B. & E., T.A., Grd. Hd.
20'x28" Metrz, T.A., New
18"x10' bed L. & S., T.A., Cone Motorized
18"x8' bed L. & S. Selective Grd. Hd., M.D.
16" 32"x8' Harrington Gap M.D.
16"x6' & 12"x6' Hendeys (2)
14"x6' bed Amer. T.A., Mo-lo-bose
TURRET LATHES, No. 6G Gator 1½", New
No. 3AL Gisholt, 8½," H.S.
No. 1 Gisholt, 1942
No. 2B Foster Univ., 3½" Capty., Bar Timken
No. 1B Foster Univ., 2" capty., M.D.
21" Acme Universal Brass, Late
18" Libby Model A Grd. Hd.
MILLER, No. 22L Van Norman, Late
MILLER, No. 4 Cinci. Univ., Hi Power, M.D.
MILLER, No. 3 Cinci. Hi Power, Motorized
MILLERS, Nos. 2 & 3 Cinci. Hi Power Univ., M.D.
MILLER, No. 2 Stand. K. & T. Univ., #50
MILLER, No. 2 Van Norman Ram, M.D.
MILLERS, No. 2 Abene (like Van Norman) New
MILLER, No. 1½ B K & T Univ., Grd. Hd.
MILLER, No. 000 B. & S. Plain, M.D., Late
MILLER, No. 0 Sundstrand Rigidmit, Hand
THREAD MILLER, 12"x60" Morey Shields, '42
PIPE MACHINE, 6" Williams Rapiduction
PRESS, 75½, Bliss S.S., 6" stroke
PRESS, 60 ton Henry & Wright Dieing
PRESS, No. 58 Toledo S.S., Grd., 171 ton capty.
PRESS, #3C Bliss 30", "Stiles", Late

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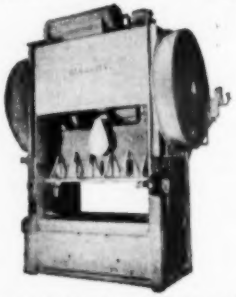

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At Ceiling Price

New Cincinnati 16x30 Vertical hydrotel Die Sinker with automatic depth control, coolant pump, 10 tracer fingers, spindle chuck, 9 collets, automatic feed with low range pick feed, sub-table.

FOB Norwalk, Connecticut
Above machine received December 1951 not used—Serial #3H1V1Y-55

NATIONAL CORED FORGINGS CO., INC.
Box 119, So. Norwalk, Conn.

MACHINERY FOR SALE

1—24" Bullard Vertical Turret Lathe, Serial #16496.

1—American Radial Drill Press 3 Ft., Serial #57224.

1—Cincinnati Radial Drill Press 3 Ft., 9" Diam., Serial #12-2653.

1—Production Air Tracer Lathe 13"x42" Monarch Mono-matic with 15 hp motor, 1800 rpm, serial #MM31848-AT, purchased in February, 1949. New Machinery Guarantee. *Immediate delivery. Fully equipped.*

FS-5932, AMERICAN MACHINIST
330 W. 42 St., New York 36, N. Y.

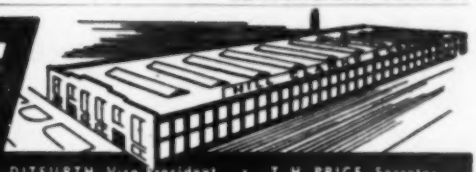
P. & W. 30" 2-Spindle Vert. Profiler
Fellows Straight Line Gear Generator
Hardinge Model MD-37 Lathe, ½" cap.
P. & W. 41½" x 36" Thread Mill, 1941

D. E. DONY MACHINERY CO.
47 Laurelton Rd., Rochester 9, N. Y.

2—FELLOWS Gear Shapers
61-A Purchased New in 1947
61 Purchased New in 1943

WINSTON MACHINERY CO., INC.
326 West Ohio St. Indianapolis 2, Ind.

HILL-CLARKE MACHINERY COMPANY



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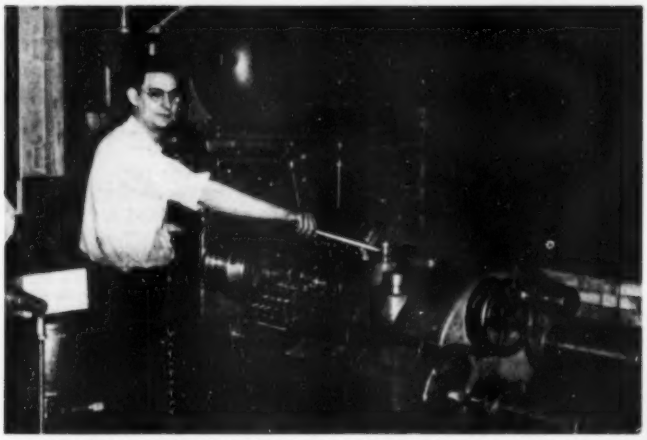


At INTERNATIONAL HARVESTER COMPANY'S TRACTOR WORKS, Chicago, is this Hill-Clarke Reconditioned 16"x33" Foy Automatic, used for first turning operation on tractor front idler shafts. International Harvester Company has been purchasing machines from Hill-Clarke for the past 45 years.

AUTOMATICS

1-1/16" Model A Cleveland (1942)

DRILLS

1 Spdl—15" Sw—No. 2 Avey, Cam Fd.
1—Spdl—24" Sw—No. 2 MA6 Avey
2 Spdl—24" Sw—No. 2 Aveymatic
2 Spdl—26" Sw—No. 3 Avey
D-21 Fox Multiple Drill, No. 2 Taper.
6' Western Radial

GEAR MACHINES

No. 12HS Gould & Eberhardt Hobber
11" Gleason Bevel Gear Generator
No. 64 Fellows Gear Shaper
No. 36-BM G & E 3 Spdl. Rougher
No. 612-A Fellows Gear Shaper
No. 616-A Fellows Gear Shaper
No. 65 Fellows—Cone Dr.
8" cap Red Ring Gear Lapper

GRINDERS

6"x18" Norton Cylindrical (1943)
Hill-Clarke Norton Type Motor Driven Grinders
10"x36" centers
10"x50" centers
10"x72" centers
10"x96" centers
14"x36" centers
14"x72" centers
18"x96" centers
18"-30" Gap x 96" centers
22"x96" centers
24"-32" Gap x 144" centers
No. 4—12"x60" B&S Univ. Gd.
No. A-3—12" Arter Rotary Surf.
5A Bryant Internal
5B Bryant Internal
No. 16-16 Bryant Internal Grd.
No. 16-28 Bryant Internal Grd.
No. 24-26 Bryant Internal Grd.
No. 81 Heald Centerless Internal
No. 74 Heald Internal Centerless

LATHES

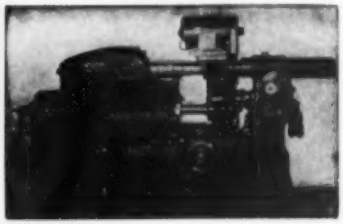
12"x21" Foy Automatic
19"x8' LeBlond Hvy. Duty Lathe
36"x18' Putnam Grd. Hd., M.D.
No. 4R Libby Turret (1942)

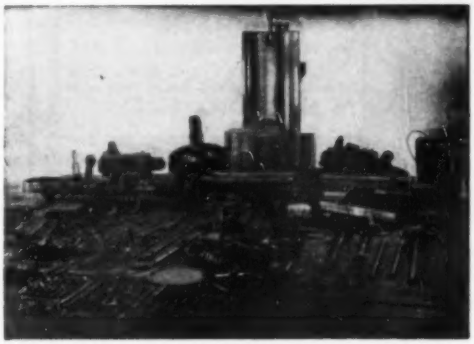
PLANERS—(Continued)

42"x42"x10' Cincinnati, 2 hds.
48"x36"x14' Gray, 2 hds.
48"x48"x12' Cincinnati, 2 hds.
48"x48"x12' Gray Maxi-Service
60"x48"x27' American, 4 hds.

MISCELLANEOUS

6"x6" capacity Marvel Hack Saw
1"-2" Dia. Cap. Micro. Hor. Hone—#200
¼"-1" Dia. Cap. Micro. Hor. Hone—#H-2
42"—18 gage Economy Power Shear
75 Ton K & K Straight Side Press
3 Ton Fox hydraulic Press
2—12"x96" Magnetic Chucks
26"x1" cap Southwark Roll
14'x⅜" cap Niles-B-Pond Roll
15" Dill Slotter
18" Dill Slotter
38" Morton Draw-Cut Shaper (1945)
No. 0 Bakewell Tapper





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LATHES (continued)

No. 4 Warner & Swasey Tur.-Bar Fd.
5W Acme Ram type Tur., 2" Capacity
No. 6 Warner & Swasey Tur.-Bar Fd.
18" Libby Tur. Lathe, M.D.
No. 3AL Gisholt
No. 4A Warner & Swasey—7⅛" Hole—Spdl.

MILLING MACHINES

54"x30"x16' Ingersoll Slab Mill
6"x168" Pratt & Whitney Thrd. Mill
10"x48" Hanson-Whitney (1942)
12"x102" Lees Bradner Thrd. Mill

PLANERS

36"x36"x12' Cincinnati, 2 hds.
36"x36"x12' Gray, 2 hds.

Attention! of SPECIAL INTEREST

Machine above

26" Swing 19" Stroke. No 24-26 Bryant Hydraulic Internal Grinder in stock as all listing on this page. Available for immediate delivery.

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fully guaranteed

ENGINE AND PRODUCTION LATHES

1—12" x 30" centers, Model CK MONARCH Tool Makers lathe, taper attach. Collet Chuck, 3 and 4 Jaw Chucks, New 1943.
1—unused HEID 17" x 78" centers Heavy Duty Engine Lathe, new 1951.
1—30" x 14' bed AMERICAN TOOL WORKS Heavy Duty Engine Lathe, taper attachment.
7—No. 4 GISHOLT Second Operation Production Forming, Facing and Cut-off Lathes, new in 1947-48, with front and rear slides, hydraulic chucking, spindle hole 4½".
2—20" x 25" FAY Automatic Lathes, 1939-40.
1—Model U SENECA FALLS LO-SWING 14" x 24" Automatic Lathe, new in 1940.
2—Gisholt Simplimatic Platen Type Production Lathes.

TURRET LATHES

2—#4R LIBBEY Univ. Ram type, for chuck work.
1—#7 BARDONS & OLIVER Univ. Ram type, for bar work 2⅞" cap. Late machine.
1—Model No. 4H-8 LIBBY Heavy Duty Saddle type Turret Lathe, new in 1940, 8¼" hole thru spindle, 32" swing.
1—1 FU Foster "Fastermatic" automatic, 1942.

VERTICAL TURRET LATHES

1—36" BULLARD spiral drive, new 1940.
1—42" BULLARD spiral drive, 1940.

AUTOMATICS

Several Model A 9/16" and 1-1/16" CLEVELAND single spindle.
1—Model B 1½" CLEVELAND Single Spindle Automatic, new 1943.

MILLING MACHINES

1—Model 3VG High Speed REED PRENTICE Vertical Mill and Die Sinker, new 1940.

CYLINDRICAL GRINDERS

1—10" x 18" NORTON type "C" Plain Grinder, 1942, with mechanical table traverse.
1—14"x36" Type CD NORTON with plunge cut and spark splitter, 1941.
1—14" x 48" CINCINNATI Self-contained Plain Grinder, 1943, with filmatic bearings.

INTERNAL GRINDERS

Several—No. 5B, No. 16 & No. 24 BRYANT Internal Grinders.
1—No. 81 HEALD Sizematic-Gagematic Combination.
2—Model No. 72A-3 HEALD Electric Indicator Automatic Internal Grinders, 1942.
2—No. 172 HEALD Hydraulic Internal Gap Grinders; new 1941-42; cross sliding and swivel workhead, swing in gap 40".
1—No. 73 HEALD Internal Grinder.

SHAPING MACHINES

1—32" GOULD & EBERHARDT heavy duty Shaper.

AND A LARGE VARIETY OF FINE TOOL ROOM AND PRODUCTION MACHINE TOOLS

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Machine

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FINE LATE TYPE GUARANTEED TOOLS

60"x20' NILES BEMENT POND Geared Head Engine Lathe, rapid traverse

28"x12' MONARCH Heavy Duty engine Lathe, taper attach., chucks, AC-MD

24"x72" centers Boye & Emmes heavy duty G.H. Engine Lathe, chuck, A.C., m.d.

16"x78" SIDNEY Toolroom Lathe, taper, chucks, new 1947

No. 3L GISHOLT Turret Lathe, 6¼" hole in spindle, bar feed, chucks, tooling, new 1945

No. 2B FOSTER Geared Head Turret Lathe, rapid traverse, AC motors

42" BULLARD Vertical Turret Lathe, New Era type, AC—MD

36" BULLARD Spiral Drive Vertical Turret Lathe, AC—MD, rebuilt

No. 3-24 Cincinnati Plain Hydromatic Mill

#2 Van Norman Plain Mill, New 1942.

5'-13" column CARLTON Radial Drill, AC motor on arm, 15-1500 RPM, box table

4' AMERICAN High Speed Sensitive Radial Drill, 9" column, AC motor on arm

No. 6 TOLEDO O.B.I. Press, 56 Tons

25A HEALD Rotary Surface Grinder, 24" diameter, magnetic chuck

10"x24" Norton Surface Grinder, New 1943.

36" OHIO Dreadnaught Shaper, AC—MD

1½" LANDIS Bolt Threader, leadscrews, AC—MD

No. 22 Murchey Threader

75 Ton HENRY & WRIGHT Double Crank Dieing Machine, roll feed & scrap cutter

No. 135 Cleveland Rigidhobbers

O'CONNELL MACHINERY CO.

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NEW AND USED

2—Potter & Johnston auto. Turret Lathes Model 6-DREL
2—Herbert Universal Turret Lathes #9S #4
2—Bardons & Oliver Turret Lathes #7 #5
3—Cincinnati Vert. Mills #0-8
2—Girards Radial Drills 3 ft. 4 ft.
2—Double end Centering Machines 10x42
1—Jones & Lamson auto. Thread Grinder 636
1—Bryant Hole & Face Grinder 16A22
1—Kent Owens Hydr. Miller 1-8
1—Landis Hydr. Internal Grinder 15x8
1—double spdl. Profiler 15x9
1—Heald hydr. Surface Grinder 25A
1—Arter Surface Grinder A-1-8
1—Logan hydr. Press, cap. 5 ton
2—Hi-speed V-Ram Shaper 20"

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SLEEPER & HARTLEY #5 UNIVERSAL SPRING COILER — CLUTCH TYPE SERIAL #131403

Wire Range—No. 3 Wire (.243 inch) to ⅜" wire

Wire Feed—from 1 to 40 feet of wire

Coil range ¾" to 8" inside diameter

Output—40 feet of wire per minute

Horsepower—15 H.P.

Weight 18,000#

This machine will coil and cut open or close coil springs—right and left hand springs—two diameter springs—coned springs with any degree of taper—coned springs with variable pitch — barrel springs with any desired crowning—will taper one end or both ends of a spring—will lay one or more coils close at one or both ends of any spring.

Equipped with coil and pitch adjustment control. This machine may be adapted for square or rectangular wire.

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#12 Martin Hydraulic Marking Machine
BAIRD Cut & Carry Drawing Press
4" RICE BARTON SPLINE MILLER
DIAL FEED POWER PRESSES
SHELL THREAD ROLLERS
30" ESPEN-LUCAS Hydraulic Cold Saw
¼" MANVILLE #1 D.S.S.D. Header
19" LE BLOND Lathe, Geared Head
#40 ANDERSON Dial Feed Tappers
#2A WARNER & SWASEY Turret Lathe
Numerous Other Machine Tools
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GARDNER VERTICAL DISC GRINDER
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Complete with Motor, Electrical Equipment and Wheel Dresser
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BORING MILLS — HORIZONTAL

Giddings & Lewis #36T Precision Table Type—Table 18"x36"—Table cross travel 24"—Spindle speeds 30 to 2000 RPM—MD—1947 machine—Like new.
Fredrick #0 Table Type—3½" bar—Table 24"x50"—Outboard support—V belt MD.
(New) 4", 5", 6", 7", and 8" Floor Type—Varniors—Central lubrication—Swivel head or plain—Outboard supports—MD.

BORING MILLS—VERTICAL

Bullard 24" Spiral Drive—Side head—3-jaw chuck table—Coolant—MD.
Bullard 42" and 54" Spiral Drive—Side heads—4-jaw chuck tables—MD.
Betts 96"—2 swivel heads—60" under cross rail—108" actual swing—MD.
Cincinnati 120" Massive Type—2 swivel heads—MD.

BROACHES

Lapointe #3L Horizontal Hydraulic—Max. stroke 52"—MD—1944 machine.
Footburt #1 Vertical Hydraulic—Max. stroke 30"—5 ton cap.—MD—Late type.

DRILLS—RADIAL

American 4'10" Triple Purpose—32 speed head—Tumbler gear box—MD.
Cincinnati-Bickford 7'22" Master Type—24 speed head—box table—AC MD.
(New) Case, Novina and 57 3', 4', 5', 6', 7', and 8' Motor-on-arm types—Box tables.

PRESSES

V & O #1, 2½, 3½, 4 and 5 Open Back Inclinable—All MD, some with Reeves drives and roll feeds—Late types.
Lempco Hypermatic—Stroke 3"—Strokes per min. 1000—Die space 18"x18¼"—MD—Very late type.
Henry & Wright 25 Ton Dialing Machine—Double roll feed—Reeves drive—Littell centering reel—MD—Late type.
Beatty #110 Heavy Duty—350 Tons ram pressure—Stroke 5"—MD—1945 machine.
Bliss #306 Straight side—Tie rod frame—Bed 26"x26"—Cap. 135 Tons—Stroke 1½"—MD.
V & O Obie Action OBI—Plunger stroke 2½"—Outer slide stroke 1¼"—MD—Late type.

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Table Size 14" x 82"
Timken Bearings No. 50 Taper
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WE CAN SUPPLY YOU WITH ALL YOUR MACHINE TOOL NEEDS

OVER 30 YEARS EXPERIENCE

AUTOMATICS

5/16" OOG Brown & Sharpe
1¼" Conomatic, 8 spindle
8", 6 spindle Bullard "A" Mult-Au-Matic
8", 6 spindle Baird Chucker, Model B.
14" x 33" Fay
20" x 25" Fay
Gisholt Simplimatics

BORING MACHINERY

3" Rockford horizontal
4" Detrick & Harvey Floor type
American vertical precision
72" Niles vertical

BROACHES

No. 1 Foote Burt duplex surface
2 ton Model HO American horizontal hyd.
10 ton No. 3XA Oil Gear horizontal hyd.
12 ton V2 American vertical hyd.
18 ton V42 American vertical hyd.

DRILLS

3' Cinti. Bickford radial
3½' American sens. radial
21" & 24" Cinti. Bick. upright
Nos. 217, 310, 321 & 36 NO Baker
No. 250 H Natco hydraulic
36 spdl. No. A16 Natco multiple

COMPLETE MACHINERY SERVICE

GRINDERS

No. 2 Cincinnati centerless
4"x12" Model H Landis
6" x 30" Cincinnati Fitmatic cyl.
10" x 18" Norton type C cyl.
21" No. 6-21-1 Besly opposed disc
22" No. 228 Hanchett opposed disc
23" No. 84 Gardner opposed disc
30" No. 84A Gardner opposed disc
53" No. 24 Gardner horizontal disc
No. 72 Heald Gagematic & Sizematic
12" & 16" No. 22 Heald rotary surface
No. 2 Brown & Sharpe universal
16"x48" Landis crankpin grinder
No. 47 Van Norman rapfloat grinder
Nos. 5, 16A, 16-28 & 24-36 Bryant

MILLING MACHINES

No. 2 Cincinnati plain, motorized
No. 3 LeBlond plain, motorized
No. 3B Kearney & Trecker, SPD
12" x 18" Cincinnati Mfg.
18" & 24" Cincinnati automatic duplex
4-36 Cincinnati hydromatic bed type
Nos. 32 & 33 Kempsmith plain Mfg. mill
Ingersoll rise and fall
4" No. M80 Taylor & Fenn spline
8" x 16" Hanson Whitney thread
No. CT 36 Lees Bradner thread
48"x36" Ingersoll

MONEY BACK GUARANTEE

PLANERS, SHAPERS & SLOTTERS

30" x 30" x 10' Cincinnati, box table
36" x 36" x 8' American double housing
36" x 36" x 8' Cleveland OS, one rail, one side head
36" x 36" x 10' Niles, AC motor drive
26" Smith & Mills back geared shaper, motorized
26" Worcester heavy duty shaper
26" Morton draw cut shaper
32" Ohio "Dreadnaught" motor drive shaper
36" Niles traveling head shaper
10" Betts slotter
12" and 16" Bement slotter
24" Niles Bement Pond Slotter

MISCELLANEOUS

3½'-8" American sensitive radial drill
¾" McCabe pneumatic flanger
Nos. 5N & 6B Nazel pneumatic forging hammers
16A16 Bryant Grinder
No. 78 Wilmarth & Mormon surface grinder
30" x 16' LeBlond Engine lathe
No. 5 Acme universal turret lathe, late
No. 5 Gisholt universal turret lathe, late
80 ton No. 50-D-36 Cleveland SS Dbl. Crank press, late
600 ton No. 2316½ Hamilton eccentric shaft coining and forging press
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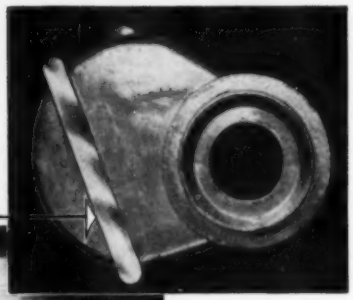

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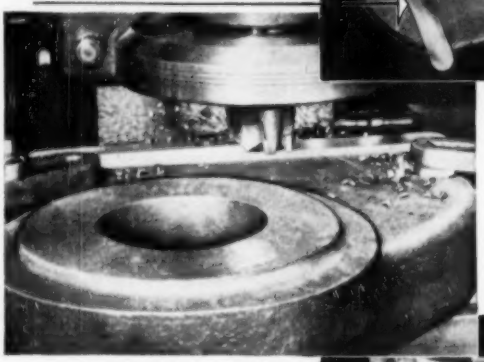

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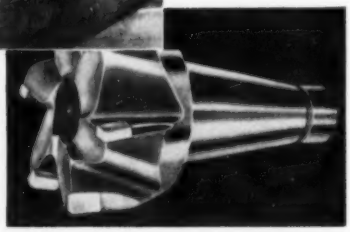

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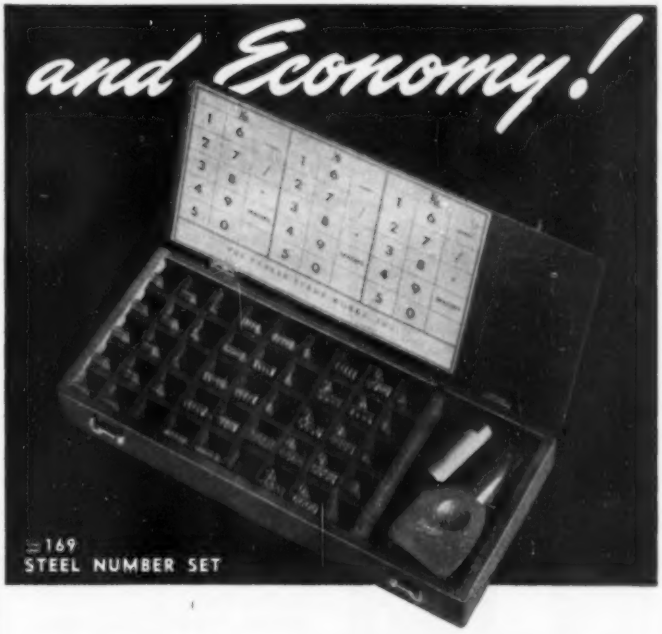

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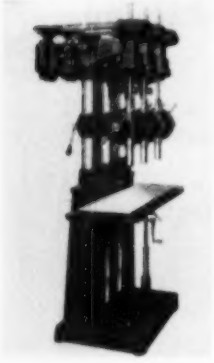
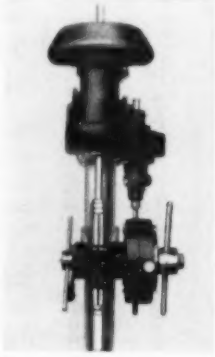


Right, showing compact power feed unit available on "Buffalo" No. 16 Drills.

Left, 3-spindle "Buffalo" No. 16 Pedestal Drill, a rugged, accurate, easy handling machine for drilling up to ¾" holes. Speed range is from 400 to 3000 rpm. Sensitive or power feed. WRITE FOR BULLETIN 2730-F.



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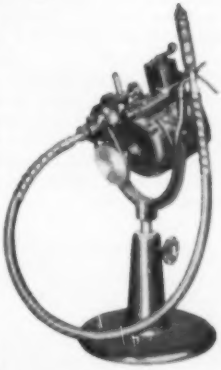
A wide selection of models and variable speeds meet requirements for shop arrangement and dependable performance when you use . . .

Strand FLEXIBLE SHAFTS

Flexible Shaft Equipment



There is a Strand flexible shaft machine to meet practically every industrial need . . . floor models, bench models, overhead models, variable speeds and power. This is quality equipment that stands up under hard usage . . . the kind you select because of dependability.

Review the models shown here, then write for catalog and full information.

FLOOR MODEL—the floor-mounted flexible shaft machine is one of the most popular. It can be moved from place to place. Amply powered, the stand is out of the way while the head is light and easy to work with. Model shown is three-speed mounted on swivel yoke adjustable floor type tripod. Available in ⅓ H. P. to 1½ H. P., inclusive.

BENCH MODEL—here is convenient flexible shaft equipment that can be mounted on bench right near the work. Portable to the extent that it can be taken from place to place. For steady, fast production, consider the bench-mounted flexible shaft machine as part of your production setup. Model shown is three-speed mounted on swivel type adjustable bench column. Available in ⅓ H. P.

OVERHEAD MODEL—for production line work, overhead-mounted flexible shaft machines are a real convenience. Motor and mechanism are out of the way and flexible shaft conveniently located. To meet your requirements, review all models of STRAND flexible shaft machines. Model shown is three-speed vertical type for overhead mounting . . . it is available in ⅓ H. P. to 1½ H. P., inclusive.

A complete selection to meet every need!

EASTERN SALES
Woodberry, Baltimore 11, Maryland

The Balmar Corporation
N. A. STRAND DIVISION

WESTERN SALES
5001 North Wolcott Ave., Chicago 40, Illinois

NEW! position material securely —in SECONDS!

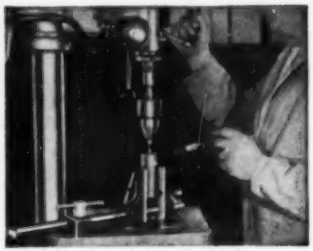
AMF FLOAT-LOCK SAFETY VISES extend the usefulness of your drill presses and band saws. Reduce material spoilage, prevent tool damage...*save money*. Insure fast, safe, accurate work.

FOR YOUR DRILL PRESS, Float-Lock is a full-floating vise for *all* set-ups in tool rooms and production. Locks instantly anywhere on table . . . becomes a dependable drill jig. Turns over on three sides for maximum flexibility. Eliminates time-wasting clamps, straps, bolts.

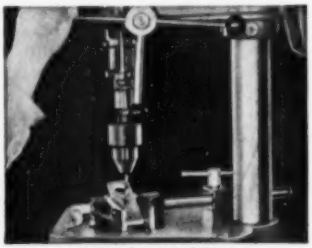
FOR YOUR BAND SAW, Float-Lock safely and securely holds all shapes and thicknesses of materials. Cutting to close tolerances made easy without hands touching material...simplifies compound angle cutting. Ideal for automatic chain-feed operation.

Order from **your industrial supply distributor** or write for illustrated folder to: Wahlstrom Float-Lock Sales Dept., American Machine & Foundry Company, 511 Fifth Avenue, New York 17, N.Y.

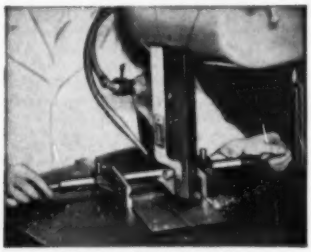
AMF Float-LOCK SAFETY VISES
FOR DRILL PRESS ★ FOR BAND SAW



Ideal for centering and end drilling



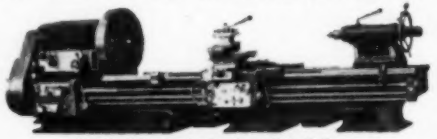
Perfect for angle drilling



Cutting irregular shapes made easy

NEW VDF HEAVY-DUTY LATHES

30¼" and 48¼" swing Turning lengths, 20' and 22'11"



Built to USA standards—Immediate Delivery

Two models. Maximum weight of work 6 tons and 10 tons. 36 spindle speeds. 30 H.P. and 50 H.P. A.C. base motors. Scales have inch graduations. Attractive price. *Write for complete details.*

KURT ORBAN COMPANY, INC.
205 East 42nd Street, New York 17, N. Y.

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AMAZING NEW TIME SAVER

Cuts time up to 90% on many production, service and maintenance operations

Millers Falls powerful versatile new No. 555 Impact Tool

Sleek, powerful, compact — this new No. 555 is the most remarkable, most versatile electric tool ever developed. Just try it. Once you see the amazing number of jobs it does — and the speed with which it does them — you'll agree that here is a tool with capabilities out of all proportion to its size.

When torque resistance is low, it drives at a continuous 1900 r.p.m. Then, when resistance rises, it automatically shifts to impact action. 2000 powerful blows per minute exert up to 100 ft. lbs. torque — ample to handle threaded parts as large as ⅝" diameter under favorable conditions.

With its rugged, powerful motor, it weighs only 6¾ lbs. It is easily controlled with one hand, quickly reversible, and built throughout for long, hard service. Write for full information, or better yet, let us arrange a demonstration. See for yourself how this heavy-duty, high-speed tool saves time and money on countless jobs.

MILLERS FALLS COMPANY, Greenfield, Mass.

Standard 1/2-inch square drive — wide variety of accessories

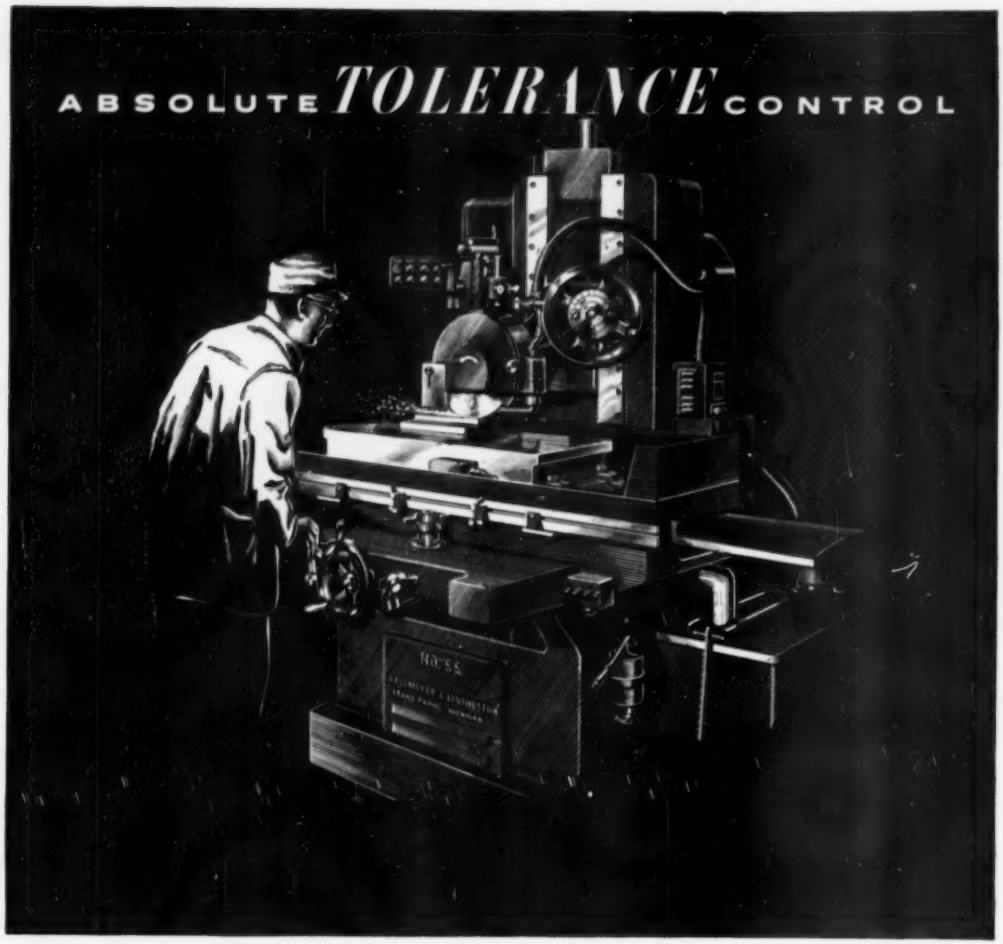
- Runs, sets, loosens and removes nuts and studs
- Taps and threads
- Extracts broken studs and bolts
- Drives screws
- Drills, reams, drives hole saws

MILLERS FALLS TOOLS SINCE 1868

The Mark of Superiority

SEND FOR BULLETIN 564

ABSOLUTE *TOLERANCE* CONTROL



When job specifications leave no leeway, when extreme tolerances must be maintained . . . that's when the built-in precision and absolute tolerance control of Grand Rapids Grinders proves most valuable. Defense commitments make it impossible for us to fill your orders as rapidly as we'd like to . . . but we know our customers can appreciate the reasons for delay. As always, we're doing our best to serve you.

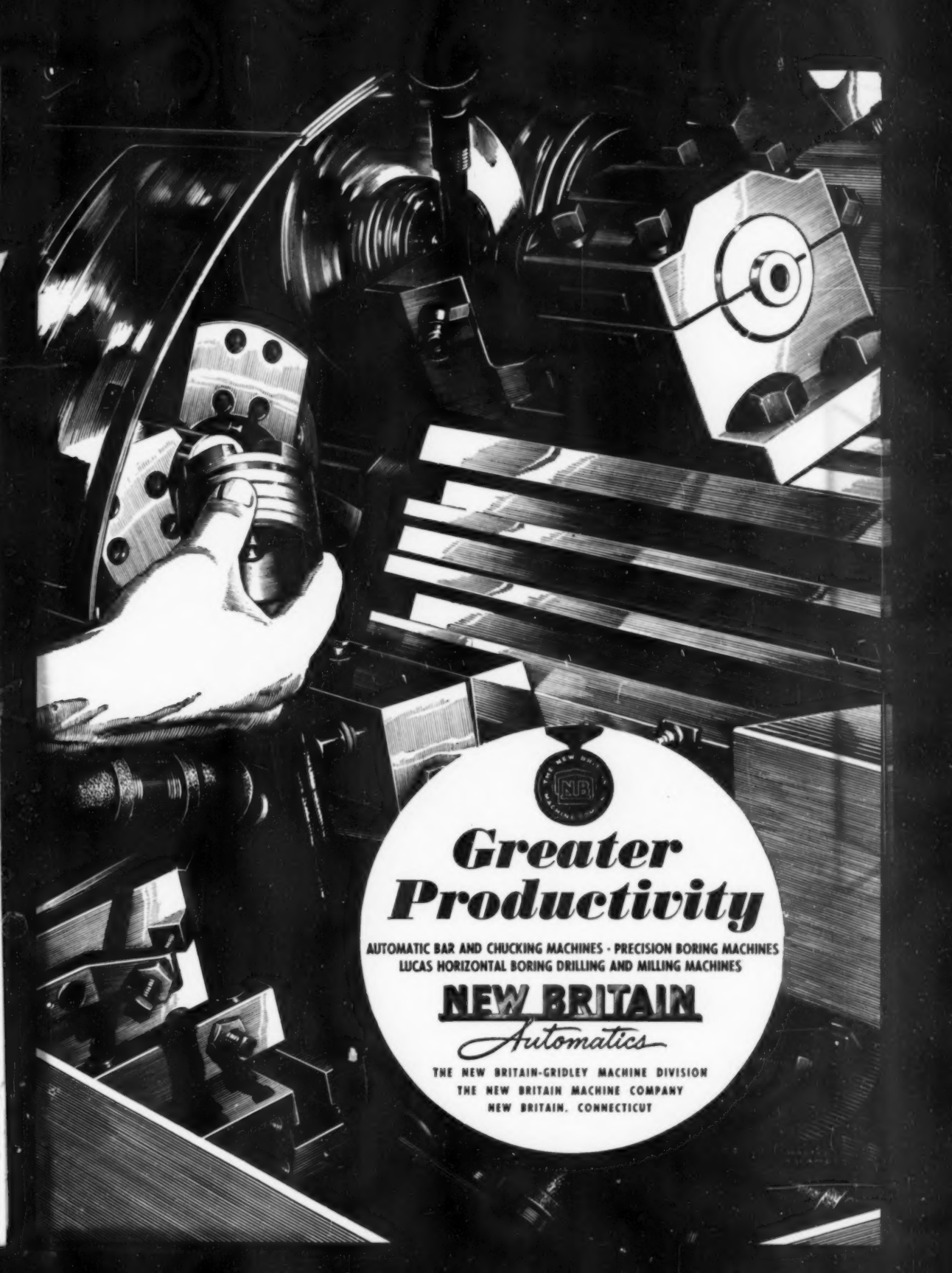
GALLMEYER & LIVINGSTON CO.
330 Straight Ave., Grand Rapids, Mich.

GALLMEYER & LIVINGSTON

GRAND RAPIDS GRINDERS

. . . the very best

Manufacturers of
SURFACE GRINDERS • CUTTER and TOOL GRINDERS • TAP and DRILL GRINDERS


Greater
Productivity
AUTOMATIC BAR AND CHUCKING MACHINES · PRECISION BORING MACHINES
LUCAS HORIZONTAL BORING DRILLING AND MILLING MACHINES
NEW BRITAIN
Automatics
THE NEW BRITAIN-GRIDLEY MACHINE DIVISION
THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT

Makes pipe threading a pipe with help of TIMKEN® bearings

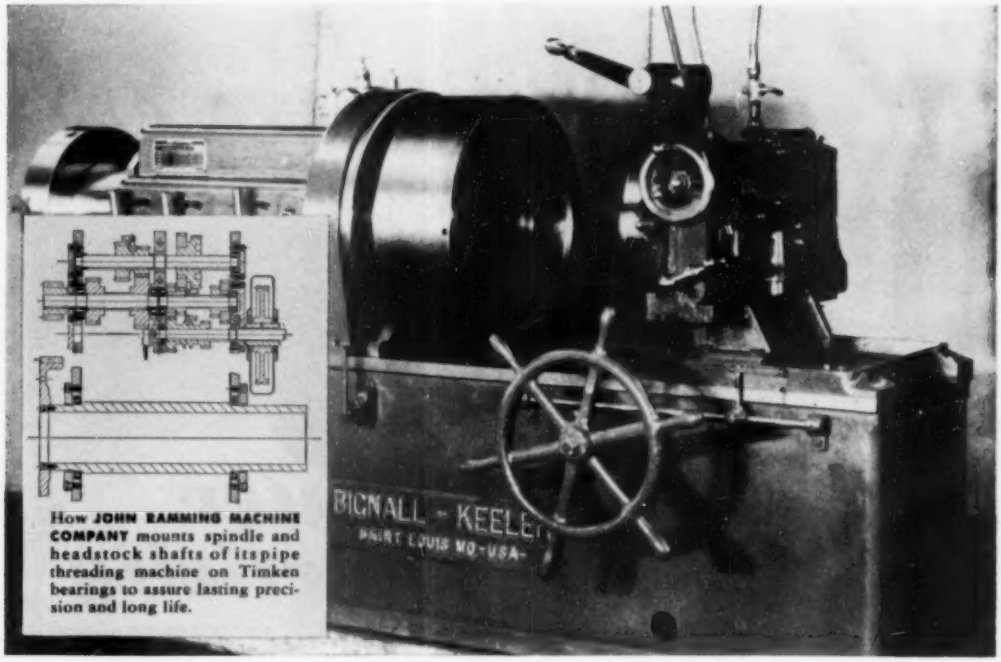
FORMERLY a tedious, time consuming job, pipe threading, reaming, beveling and cutting is done easily and quickly with this Bignall & Keeler pipe threading machine built by John Ramming Machine Co. To maintain its high standards of precision for years of use, and keep it running smoothly without chatter, John Ramming Machine Company mounts the spindle and headstock shafts on Timken® precision bearings.

Timken tapered roller bearings on the spindle take radial and thrust loads in any combination—assure spindle rigidity. In the gear train, Timken bearings hold shafts in proper alignment—help make gears mesh smoothly with less wear. A smooth flow of power is assured over a wide range of speeds and feeds.

The true rolling motion and incredibly smooth finish of Timken bearings practically eliminate friction. Wear is minimized and precision is maintained throughout the machine's moving parts.

No other bearing can give you all the advantages you get with Timken tapered roller bearings. Make sure you have them in the machines you buy or build. Look for the trademark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



How **JOHN RAMMING MACHINE COMPANY** mounts spindle and headstock shafts of its pipe threading machine on Timken bearings to assure lasting precision and long life.

GREATER LOAD AREA

Because the load is carried on the *line* of contact between rollers and races, Timken bearings carry greater loads, hold shafts in line, wear longer.

The Timken Roller Bearing Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

TIMKEN

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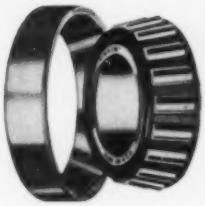
TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ▯ AND THRUST —▯— LOADS OR ANY COMBINATION —✳—